KENWOOD®

SERVICE MANUAL

TR-7730

VHF FM TRANSCEIVER

CONTENTS

TR-7730

SPECIFICATIONS/CIRCUIT DESCRIPTION

[General]		
Semiconductors	ICs	15 (K, M) 16 (W, T)
	Transistors	46 (K, M) 49 (W, T)
	FETs	7
	Diodes	91 (K, M) 95 (W, T)
Frequency range	144.000 to 147.995 MHz (K, M) 144.000 to 145.995 MHz (W, T)	
Frequency synthesizer	Digital control, phase locked VCO	
Mode	FM (F3)	
Antenna impedance	50 ohms	
Power requirement	13.8 V DC ±15%	
Grounding	Negative	
Operating temperature	−20°C to +60°C	
Current drain	0.4A in receive mode with no input signal	
	5.5A in HI transmit mode (Approx.)	
	3A in LOW transmit mode (Approx.)	
	Less than 2.5 mA for memory back up (from power supply)	
Dimensions	147.5 mm (5-3/4″) wide	
	51.5 mm (2″) high	
	198.0 mm (7-3/4″) deep	
	(projections excluded)	
Weight	1.5 kg (3.3 lbs) (Approx.)	

[Transmitter Section]	
RF output power	
(at 13.8 V DC, 50 Ω load)	HI 25 Watts min.
	LOW 5 Watts approx. (Adjustable)
Modulation	Variable reactance direct shift
Frequency tolerance	Less than $\pm 20 \times 10^{-6}$
(−10°C ~ +50°C)	
Spurious radiation	HI Less than −60 dB
	LOW Less than −53 dB
Maximum frequency deviation (FM)	±5 kHz
Microphone	Dynamic microphone with PTT, up, down, switches, 500 Ω

[Receiver Section]		
Circuitry	Double conversion superheterodyne	
Intermediate frequency	1st IF	10.7 MHz
	2nd IF	455 kHz
Receiver sensitivity	Better than 0.5 μV for 30 dB S/N	
	Better than 0.25 μV for 12 dB SINAD	
Receiver selectivity	More than 12 kHz (−6 dB)	
	Less than 25 kHz (−60 dB)	
Spurious response	Better than 60 dB	
Squelch sensitivity	0.16 μV (threshold)	
Audio output	More than 2.0 watts across 8 ohm load (10% dist.)	

Note: Circuit and ratings are subject to change without notice due to developments in technology.

NOTE : Letter designations used in this manual :

K	U.S.A.	X	AUSTRALIA
T	BRITAIN	M	GENERAL MARKET
W	EUROPE		

< RECEIVER SECTION >

RX.TX UNIT (X44-1450-XX)

The antenna signal is applied to the RF amplifier (Q3 : 3SK76), a dual gate MOS FET and helical resonator L5 (3 poles) and L6 (2 poles), and is then converted to the 10.7 MHz 1st IF signal by Q4, the 1st mixer.

A 2-stage MCF (Monolithic crystal filter) is used in the 1st IF stage. All this achieves high dynamic range and high sensitivity.

The 1st IF signal, after passing through the MCF, is mixed with the 10.245 MHz 2nd local oscillator signal, generated by Q5 to obtain a 455 kHz 2nd IF signal.

This signal passes through the ceramic filter (CFW455F) and is amplified by IC1, Q7 through Q10, and is then demodulated. An S meter signal is obtained by detecting the signal from the collector of Q7 by diodes D2 and D3, and is then applied to the display unit. The S meter uses 8 LEDs, and indicates 6 amber and 1 red LED when the antenna input level is 15 dBμ.

CIRCUIT DESCRIPTION

Item	Rating
Nominal center frequency (*fo*)	10.7 MHz
Pass bandwidth	*fo* ±7.5 kHz or more at 3 dB
Attenuation bandwidth	*fo* ±25 kHz or less at 40 dB *fo* ±45 kHz or less at 60 dB
Guaranteed attenuation	70 dB or more within *fo* ±1 MHz 80 dB or more within *fo* – (910 kHz ± 10 kHz)
Spurious	40 dB or more within *fo* to *fo* +500 kHz
Ripple	1.0 dB or less
Loss	1.5 dB or less
Input and Output impedance	3kΩ
Operating temperature	–20°C~+70°C

Table 1 MCF (L71-0219-05) (RX.TX unit, L17)

Item	Rating
Nominal center frequency	455 kHz
6 dB bandwidth	±6 kHz or more
50 dB bandwidth	±12.5 kHz or less
Ripple (within 455 ±4 kHz)	3 dB or less
Loss	6 dB or less
Guaranteed attenuation (within 455±100 kHz)	35 dB or more
Input and output impedance	2.0 kΩ

Table 2 Ceramic filter CFW455F (L72-0315-05) (RX.TX unit, L18)

Item	Rating
Center frequency and deviation	455 kHz ±1.0 kHz
Peak separation	15 kHz or more
Voltage sensitivity (at 455 kHz)	15 mV/kHz or more
Operating temperature	–10°C~+50°C

Table 3 Ceramic discri CFY455S (L79-0446-05) (RX.TX unit, L19)

< TRANSMITTER >

RX.TX UNIT (X44-1450-XX)

The microphone signal is amplified and limited by IC2 (TA7061AP), and is then applied to D1 (1S2208) in the PLL unit to directly modulate the VCO. The VCO generates 144~145.995 MHz (W, T) or 143.9~148.995 MHz (K, M) according to the control signal from the microprocessor.

The VCO signal is amplilfied by Q2 and Q3 in the PLL unit, and then applied to the RX.TX unit via the LT terminal. The signal is amplified by Q1 and Q2 before it is applied to the power module. This simple transmitter structure provides superior spurious radiation characteristic.

The HIGH/LOW switch signal is applied to Q28, Q22 and Q21 in the RX.TX unit, which controls the B+ voltage applied to the driver stage (Q2), so that final input and output power is varied. The RF meter is adjusted so that 6 amber LEDs light at HIGH power. However, the number of LEDs on may vary according to the VSWR of the antenna system.

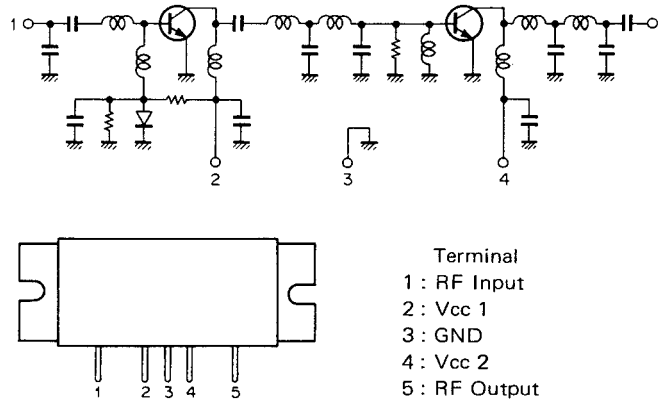


Fig. 1 POWER MODULE VP-15E1305

Item	Symbol	MAX Rating	Condition
Power supply voltage	Vcc	17V	Tc = 25°C
DC current	Icc	8A	Tc = 25°C
Operating case temperature	Top	–30~100°C	
Storage temperature	Tstg	–40~110°C	

VP-15E1305 MAX Rating

Item	Symbol	Condition	Rating			Unit
			MIN	TYP	MAX	
f range	*f*		144		148	MHz
Power input	Pin			250		mW
Power output	Po	Pin = 250 mW Vcc = 13.0 V	30			W
Operating voltage	Vcc			13.0		V
Input and output impedance	Z	Pin = 250 mW Vcc = 13.0 V		50		Ω
Total efficiency	ηT	Pin = 250 mW Vcc = 13.0 V	45	50		%

VP-15E1305 Electrical Characteristic

CIRCUIT DESCRIPTION

PLL CIRCUIT (X50-1750-10)

VCO Q1 : 2SK19 (GR) generates 143.900~148.995 MHz (K, M) or 144.00~145.995 MHz (W, T) during transmission and 133.200~138.295 MHz (K, M) or 133.30~135.295 MHz (W, T) during reception.

The VCO signal is buffered by Q2 and amplified by Q3 and Q4. It is then mixed with the HET signal (from Q5) by Q12 to obtain a PLL IF signal (5.4~10.495 MHz [K, M] or 5.5~7.49 MHz [W, T]).

The HET signal is generated by Q5, a third overtone oscillator using a 46.1666 MHz crystal to generate 138.5 MHz for transmission and a 42.6 MHz crystal to generate 127.8 MHz for reception. Both frequencies are shifted 5 kHz when the 5K control signal from the control unit (X53-1120-10) is applied to D9 and D10 to shunt TC3 and TC4.

The resonant frequencies of L5, L7, L10, and the VCO tank circuit and the HET frequency are switched for reception and transmission using the 8R (8V DC during reception) and 8T (8V DC during transmission) control lines.

The PLL IF signal is amplified by Q10 and buffered by Q11 and Q9, and then applied to pin 2 of IC3 (TC9122P) the programmable divider. IC3 is supplied with frequency dividing data from the control unit : 550~1049 (K, M) or 550~749 (W, T) in BCD, and the PLL IF frequency is also divided to a 10 kHz signal for a phase-lock comparison signal. IC2 (TC5082P-GL) is the 10.24 MHz oscillator. Its output is divided by 1024 to 10 kHz for IC1's reference signal. These comparison and reference signals are input to the phase comparator (IC1 : TC5081P) and the resultant DC output signal is applied through the low pass filter Q8 and Q7 to the VCO tank circuit through varicap diode (D2 : 1S2208) to control the VCO output frequency. If the PLL unlocks, the voltage at IC1 pin4 drops to turn off Q6 and D11, which shuts off Q3.

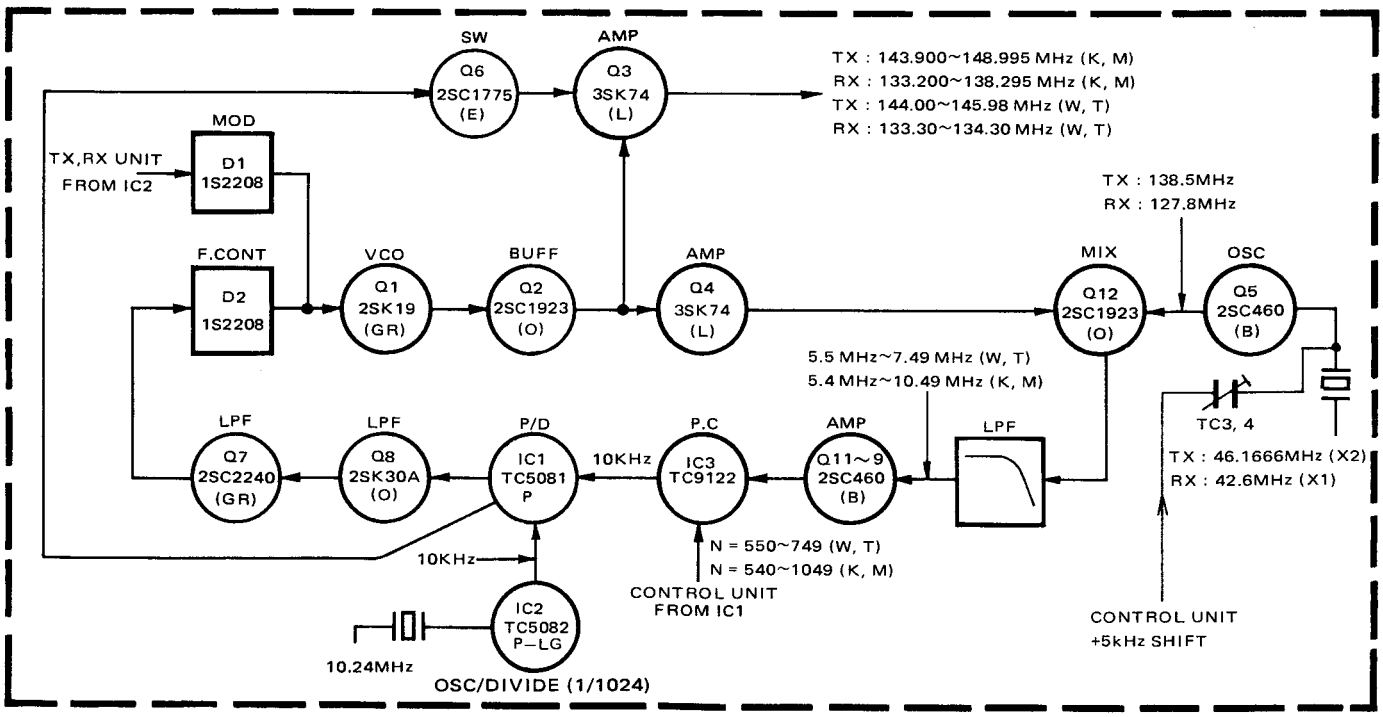


Fig. 2 PLL unit block diagram

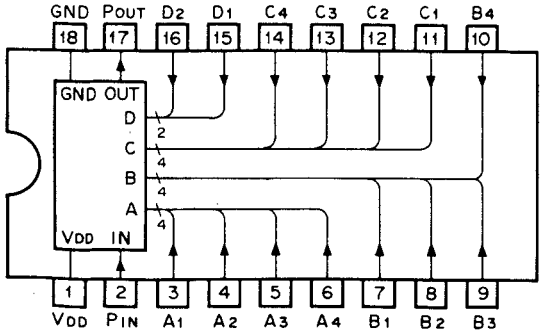
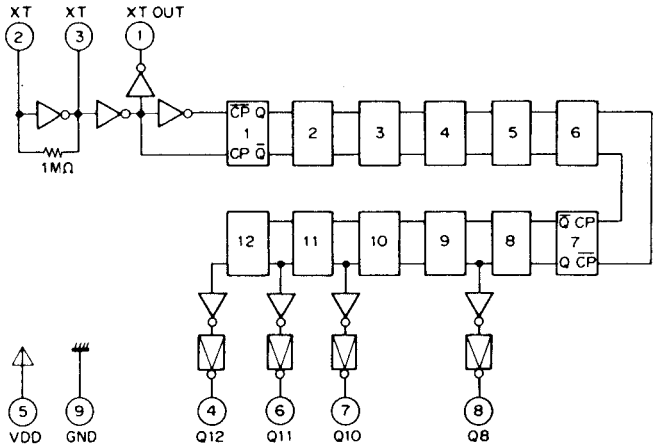


Fig. 3 TC9122P (PLL unit, IC3)

Symbol	Name	Content and operation	Remarks
Pin	Programmable counter input terminal	Programmable counter input terminal to which the signal to be divided is input.	Build-in bias circuit
Pout	Programmable counter output terminal	Programmable counter output terminal. Output is 1/N of the input frequency. The output pulse width equals 5 bit of the input.	
$A_1 \sim A_4$ $B_1 \sim B_4$ $C_1 \sim C_4$ $D_1 \sim D_4$	× 1 × 10 Program input × 100 terminals × 1000	Terminal to set the dividing ratio. The following input combination is prohibited A_1 A_2 A_3 A_4 B_1 B_2 B_3 B_4 C_1 C_2 C_3 C_4 D_1 D_2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0	Built-in pull-down resistor

Table 4 TC9122P (PLL unit, IC3)

CIRCUIT DESCRIPTION



PIN NO	8	7	6	4	1
PIN NAME	Q_8	Q_{10}	Q_{11}	Q_{12}	XT_{out}
Dividing ratio	1/256	1/1024	1/2048	1/4096	1/1
Output frequency X-tal 10.24 MHz	40 kHz	10 kHz	5 kHz	2.5 kHz	10.24 MHz

Fig. 4 TC5082P-GL (PLL unit, IC2)

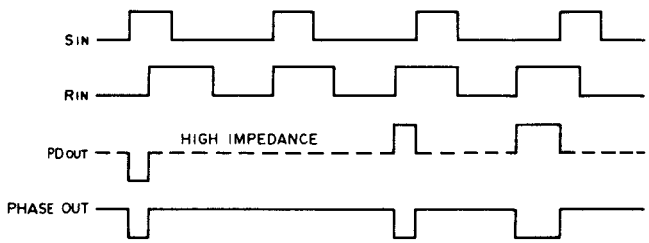


Fig. 5-A TC5081P (PLL unit, IC1) Timing chart

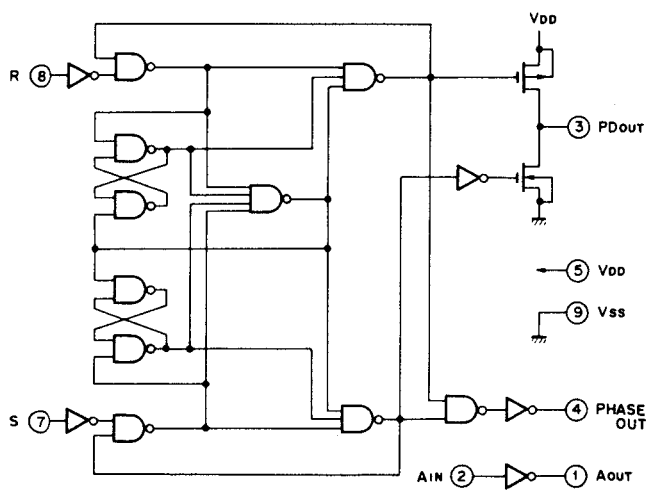


Fig. 5-B TC5081P (PLL unit, IC1) Equivalent circuit

CONTROL CIRCUIT (X53-1230-10)

Fig. 6 shows a block diagram of the control circuit, which uses a microprocessor to minimize the number of peripheral circuits.

- **Frequency Indicator**

The frequency indicator uses a 4 digit dynamically driven LED display. The BCD data from the microprocessor D port (pins 8~11) is converted by decoder driver IC2 (TC 5022BP) into the segment signals which are applied to the corresponding segments of all digits. The signals from the E port (pins 12~15) turn ON Q7 through Q10 (2SC1959) to light the digits.

- **PLL Data (Frequency Dividing Data)**

The frequency dividing data is output from ports D, E, G,H and I (pins 9~11, 12, and 22~32) in BCD. It is 550 when 4.00 is displayed, 650 when 5.00 is displayed, 749 when 5.99 is displayed and 1049 (K, M only) when 8.99 is displayed.

- **Reset Circuit**

Current flows through D36 when the power source voltage supplied to the microprocessor exceeds about 3.5V. The collector voltage of Q5 (2SC1815 (Y)) then becomes H and a pulse is generated by the CR differentiating circuit. This pulse is applied to and resets the microprocessor.

- **Switch Circuit**

One terminal of each control switch is connected to one of the control pulse signal output terminals of the microprocessor and the other terminal to one of the input terminals. When a control switch is turned ON, the corresponding output pulse signal is input to the corresponding input terminal and the prescribed function is performed. Diodes are used to prevent the control pulse signals from being input to the wrong circuit.

- **Encoder and UP/DOWN Switch Input Circuit**

The mechanical encoder output signals are applied to the Schmitt circuits formed by IC102 (TC7404UBP), then applied to port A (pins 33~36) of the microprocessor. The microprocessor judges UP/DOWN and counts the number of applied pulses. One turn of the dial equals 50 step output.

- **Scan Circuit**

Scan operation is controlled entirely by the microprocessor. It starts when the SCAN switch is pressed and stops when either the HOLD switch is pressed or the transmit signal (8T) becomes H. Scan operation temporarily stops when the squelch stop signal (input to the SS terminal) becomes H. Variation of the frequency dividing data for the least significant digit is detected by the circuit consisting of Q1, Q2 and the OR circuit D10~13 so that a pulse is obtained every time the data changes. This pulse signal is applied to the scan stop terminal (pin 4) of the microprocessor to momentarily suspend slow scanning after the frequency has been changed.

CIRCUIT DESCRIPTION

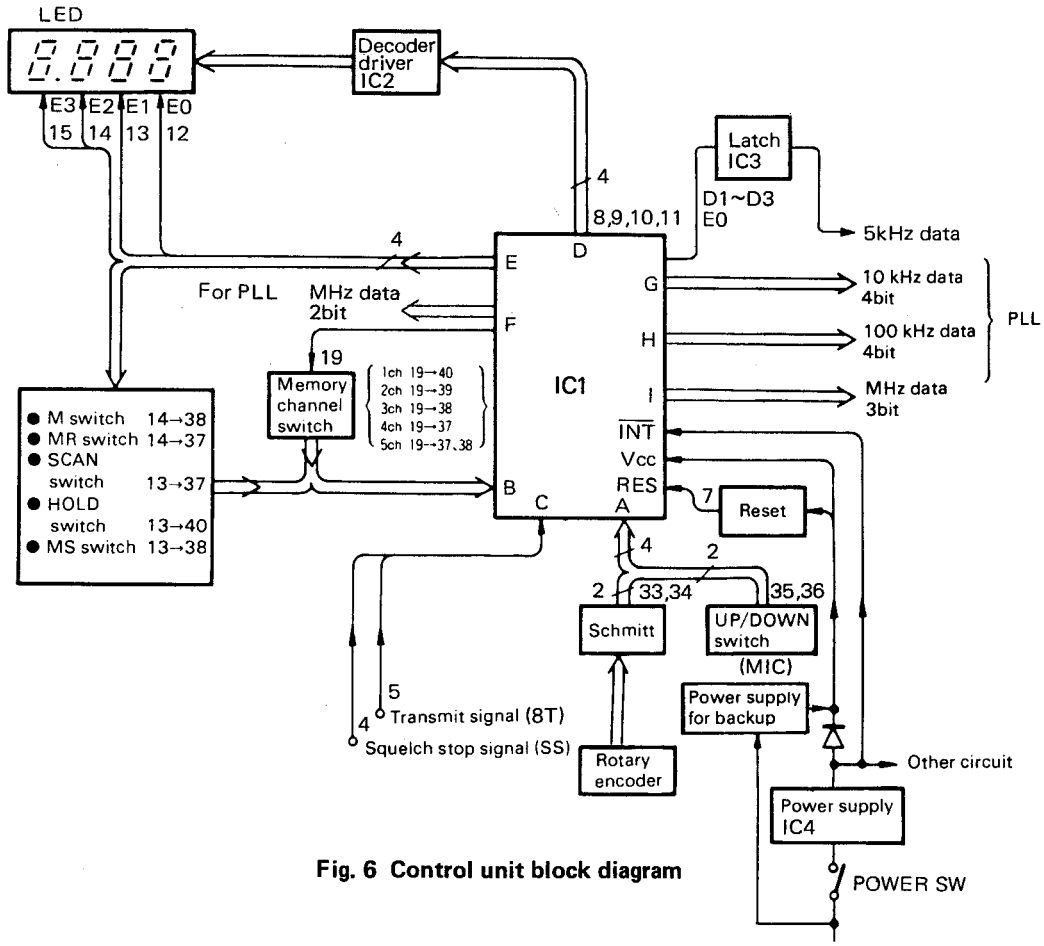


Fig. 6 Control unit block diagram

Pin No.	Pin	Input signal	Output signal	Note	Pulse signal
1	CL1			Clock signal 400 kHz	
2	PC0			Normally L	
3	PC1	O		Normally L	
4	PC2	O		Squelch signal, SCAN stops when H.	
5	PC3	O		Normally L, H during transmission.	
6	$\overline{INT}$	O		Normally H	
7	RES	O		Microprocessor is reset when H.	
8	PD0	O	O	10 kHz, 100 kHz, and MHz digit signals are output.	O
9	PD1	O	O		O
10	PD2	O	O		O
11	PD3	O	O		O
12	PE0		O	5 kHz digit signal is output.	O
13	PE1		O	10 kHz digit signal, SCAN, HOLD or M.S is output.	O
14	PE2		O	100 kHz digit signal, M or MR is output.	O
15	PE3		O	1 MHz digit signal is output.	O
16	PF0			Not connected.	
17	PF1		O	1 MHz data signals for PLL — L	
18	PF2		O	1 MHz data signals for PLL — L	
19	PF3		O	Memory output signal	O
20	TEST			Normally H	
21	Vcc			5 V power supply	

Pin No.	Pin	Input signal	Output signal	Note	Pulse signal
				(Level at 145.00 MHz)	
22	PG0		O	A — 10 kHz data signals for PLL — L	
23	PG1		O	B — 10 kHz data signals for PLL — L	
24	PG2		O	C — 10 kHz data signals for PLL — L	
25	PG3		O	D — 10 kHz data signals for PLL — L	
26	PH0		O	A — 100 kHz data signals for PLL — H	
27	PH1		O	B — 100 kHz data signals for PLL — L	
28	PH2		O	C — 100 kHz data signals for PLL — H	
29	PH3		O	D — 100 kHz data signals for PLL — L	
30	PI0		O	A — 1 MHz data signals for PLL — L	
31	PI1		O	B — 1 MHz data signals for PLL — H	
32	PI2		O	C — 1 MHz data signals for PLL — H	
33	PA0	O		Encoder signal	
34	PA1	O		Encoder signal	
35	PA2	O		Normally H, L when MIC UP switch is pressed.	
36	PA3	O		Normally H, L when MIC DOWN switch is pressed.	
37	PB0	O		MR, SCAN, Memory CH4 or 5 pulse signal is input.	O
38	PB1	O		M, MS, Memory CH3 or 5 pulse signal is input.	O
39	PB2	O		Memory CH2 pulse signal is input.	O
40	PB3	O		STEP or Memory CH1 pulse signal is input.	O
41	GND			GND	
42	CL0			Clock signal 400 kHz	

Table 5 Microprocessor Functions μPD650C-021 (Control unit, IC1)

CIRCUIT DESCRIPTION

- **Power Supply for control system**

Transistor Q6 (2SC496 (Y)) generates 5V for the frequency display. A 6V AVR (Automatic voltage regulator) IC (IC4 : NJM78L06K) supplies power to the microprocessor through diode D18.

- **Backup Circuit**

The level at the microprocessor INT terminal becomes L when the POWER SW is turned OFF, and the microprocessor enters the backup mode. In this mode, all output ports are low to minimize power consumption. At power OFF, the backup supply is Q24 (2SC2603 (E)) on the RX.TX unit.

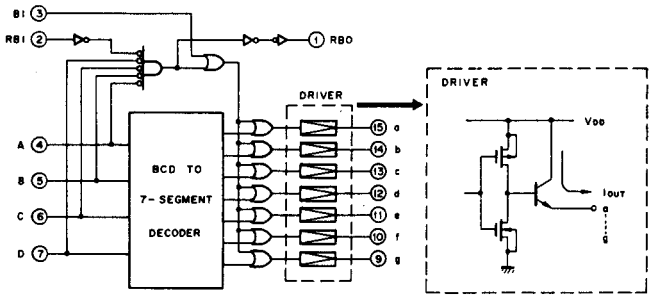


Fig. 7 TC5022BP (Control unit, IC2) Equivalent circuit

INPUT						OUTPUT							
BI	RBI	A	B	C	D	a	b	c	d	e	f	g	
H	*	*	*	*	*	L	L	L	L	L	L	L	☆
L	H	L	L	L	L	L	L	L	L	L	L	L	H
L	L	L	L	L	L	H	H	H	H	H	H	L	L
L	*	H	L	L	L	L	H	H	L	L	L	L	L
L	*	L	H	L	L	H	H	L	H	H	L	H	L
L	*	H	H	L	L	H	H	H	H	L	L	H	L
L	*	L	L	H	L	L	H	H	L	L	H	H	L
L	*	H	L	H	L	H	L	H	H	L	H	H	L
L	*	L	H	H	L	H	L	H	H	H	H	H	L
L	*	H	H	H	L	H	H	H	L	L	H	L	L
L	*	L	L	L	H	H	H	H	H	H	H	H	L
L	*	H	L	L	H	H	H	H	H	L	H	H	L
L	*	L	H	L	H	H	H	H	H	H	H	L	L
L	*	H	H	L	H	L	H	H	L	L	L	L	L
L	*	L	L	H	H	H	H	L	H	H	L	H	L
L	*	H	L	H	H	H	H	H	H	L	L	H	L
L	*	L	H	H	H	L	H	H	L	L	H	H	L
L	*	H	H	H	H	H	L	H	H	L	H	H	L

☆ ; Undetermined
* ; Don't Care

Table 6 TC5022BP (Control unit, IC2) Truth table

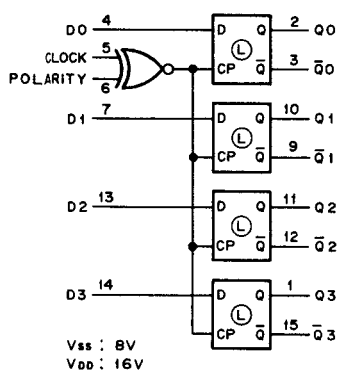


Fig. 8 TC4042BP Block diagram

INPUTS		OUTPUT
CLOCK △	POLARITY	Qn *
H	H	Dn
L	L	Dn
↑	L	LATCH
↓	H	LATCH

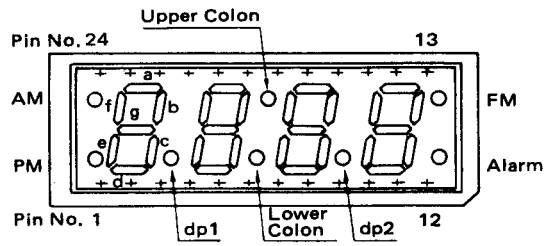
△ Level change

* n : 0~3

Table 7 TC4042BP Truth table

When the POWER SW is turned ON, the levels at both the INT (pin 6) and UP/DOWN (pins 35 and 36) terminals become H, returning the microprocessor to operation as before the POWER SW was turned OFF.

Input port B pins (37~40) are grounded by Q3 and Q4 when the POWER SW is turned OFF, and scan operation is stopped by momentarily simulating the transmission mode through Q11.



PIN NO	FUNCTION		PIN NO	FUNCTION	
1	PM	Anode	13	FM, Alarm	Cathode
2	Dig 1	Cathode	14	FM	Anode
3	Seg d	Anode	15	Seg a	Anode
4	dp 1	Anode	16	dp 2	Cathode
5	Dig 2	Cathode	17	Upper/Lower Colon	Cathode
6	Lower Colon	Anode	18	Seg f	Anode
7	Upper Colon	Anode	19	Seg b	Anode
8	Dig 3	Cathode	20	Seg c	Anode
9	dp 2	Anode	21	dp 1	Cathode
10	Dig 4	Cathode	22	Seg g	Anode
11	Seg e	Anode	23	AM	Anode
12	Alarm	Anode	24	AM, PM	Cathode

Fig. 9 4-digit LED LN543RK (Display unit, D1)

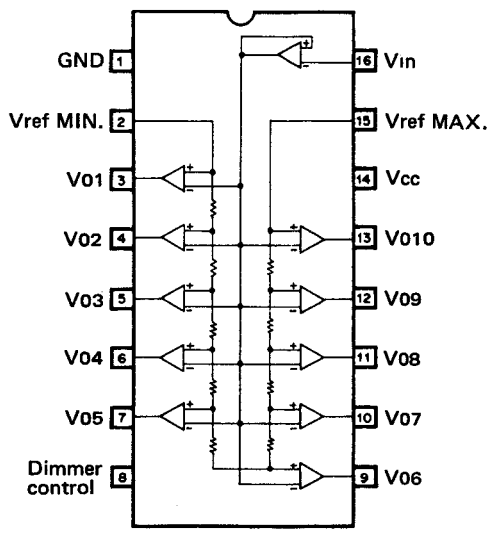
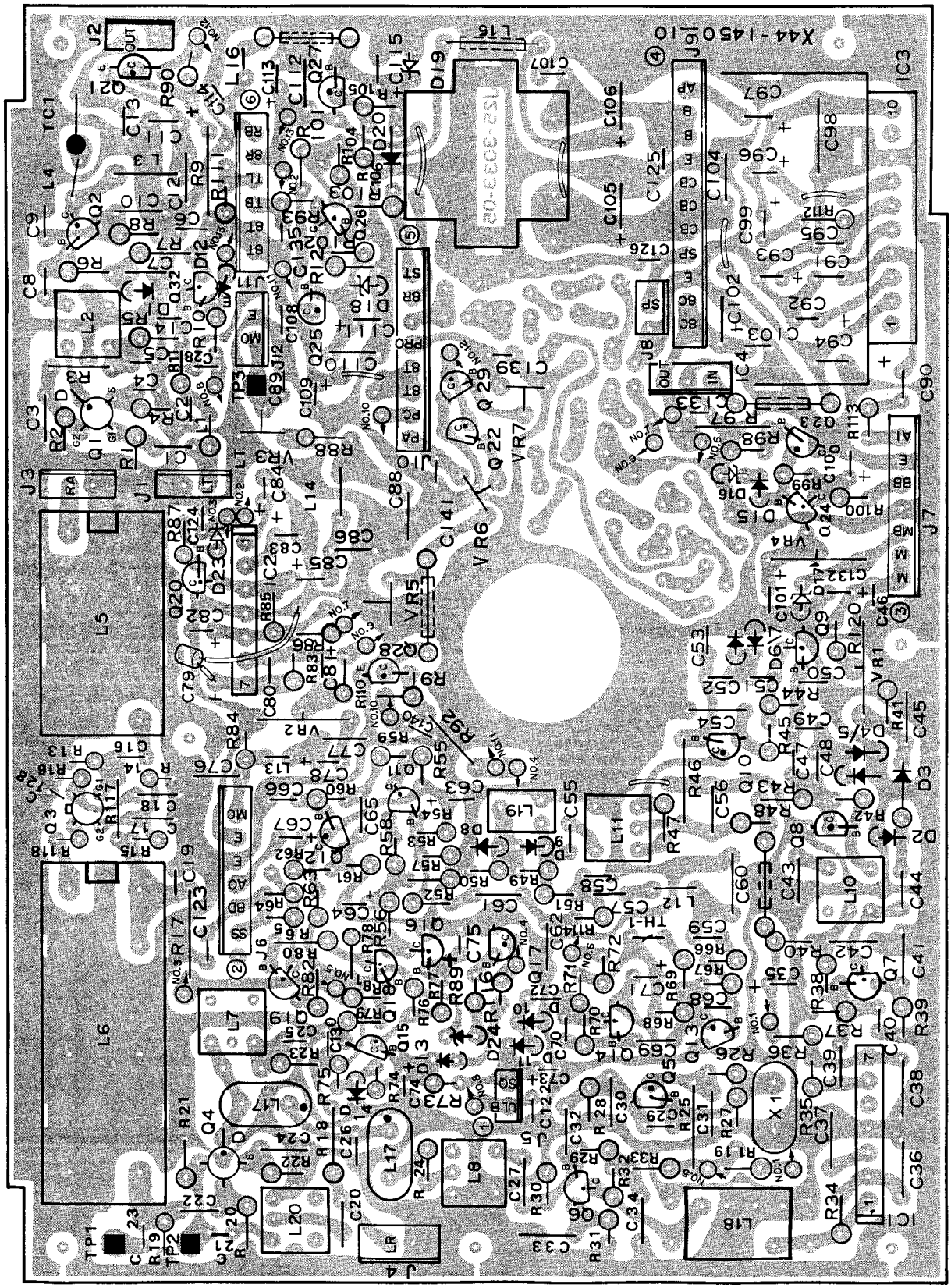


Fig. 10 TA7612AP (Display unit, IC1)

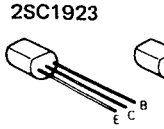
TR-7730 PC BOARD VIEW

▼RX.TX UNIT (X44-1450-10) (K, M TYPE) Components side view

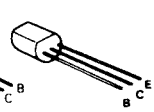


Q1,4 : 3SK74(L) Q2 : 2SC2538 Q3 : 3SK76 or 3SK92 Q5,7~10 : 2SC460(B) Q6 : 2SC1923(O) Q11~14 : 2SC1815(Y) Q15~18, 20, 23, 24 : 2SC2603(E)
Q19 : 2SA1115(E) Q21, 25, 27 : 2SC496(Y) Q22, 28, 29 : 2SC458(B) Q26 : 2SA1015(Y) Q32 : 2SA562TM(Y)
IC1 : TA7302P IC2 : TA7061AP IC3 : HA1366W IC4 : μPC78L08A
D1,4~7, 12, 13, 15, 20 : 1S1555 D2, 3, 8~11 : 1N60 D14 : 1S1212 D16 : XZ-060 D17 : XZ-070 D18 : XZ-100 D19 : XZ-090 D23, 24 : WZ-040

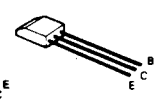
2SA1015
2SC1815
2SC1923



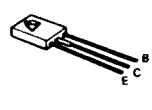
2SC2538



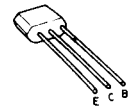
2SC458
2SC460



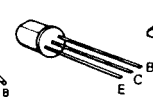
2SC496



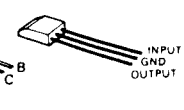
2SA1115
2SC2603



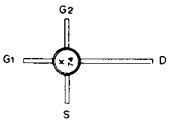
2SA562-TM



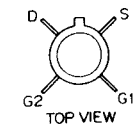
μPC78L08A



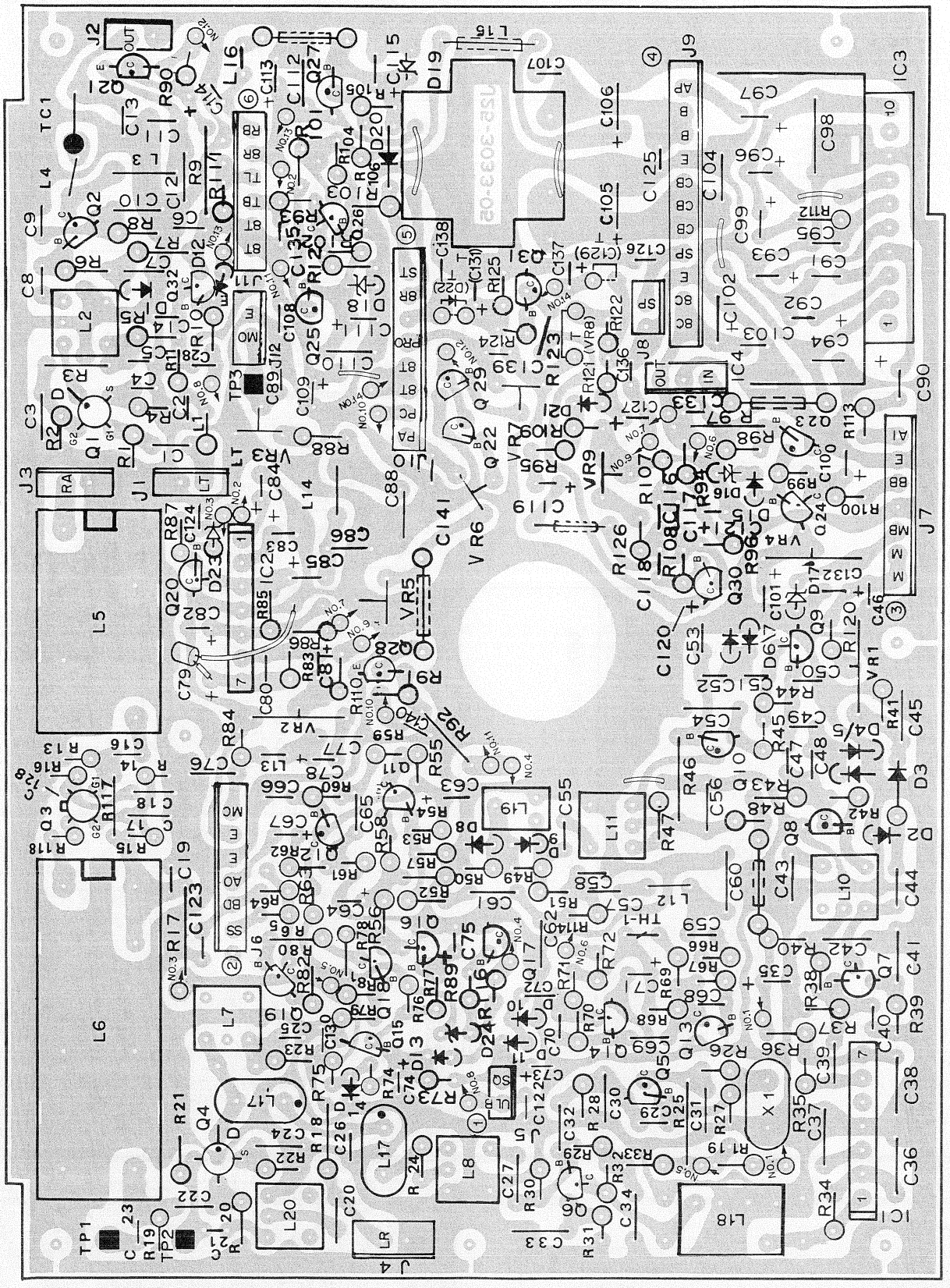
3SK74



3SK76
3SK92

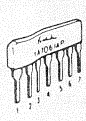


▼RX.TX UNIT (X44-1450-51, -61) (T, W TYPE) Components side view

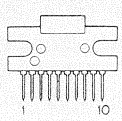


Q1, 4 : 3SK74(L) Q2 : 2SC2538 Q3 : 3SK76 or 3SK92 Q5, 7~10 : 2SC460(B) Q6 : 2SC1923(O) Q11~14 : 2SC1815(Y) Q15~18, 20, 23, 24 : 2SC2603(E)
Q19 : 2SA1115(E) Q21, 25, 27 : 2SC496(Y) Q22, 28~31 : 2SC458(B) Q26 : 2SC1015(Y) Q32 : 2SA562TM(Y)
IC1 : TA7302P IC2 : TA7061AP IC3 : HA1366W IC4 : μPC78L08A
D1, 4~7, 12, 13, 15, 20~22 : 1S1555 D2, 3, 8~11 : 1N60 D14 : 1S1212 D16 : XZ-060 D17 : XZ-070 D18 : XZ-100 D19 : XZ-090 D23, 24 : WZ-040

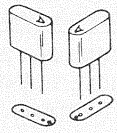
TA7061AP
TA7302P



HA1366W

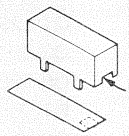


< Attachment direction of L17 >

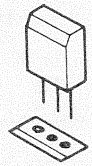


L17 should be used as a pair.

< Attachment direction of L5, 6 >



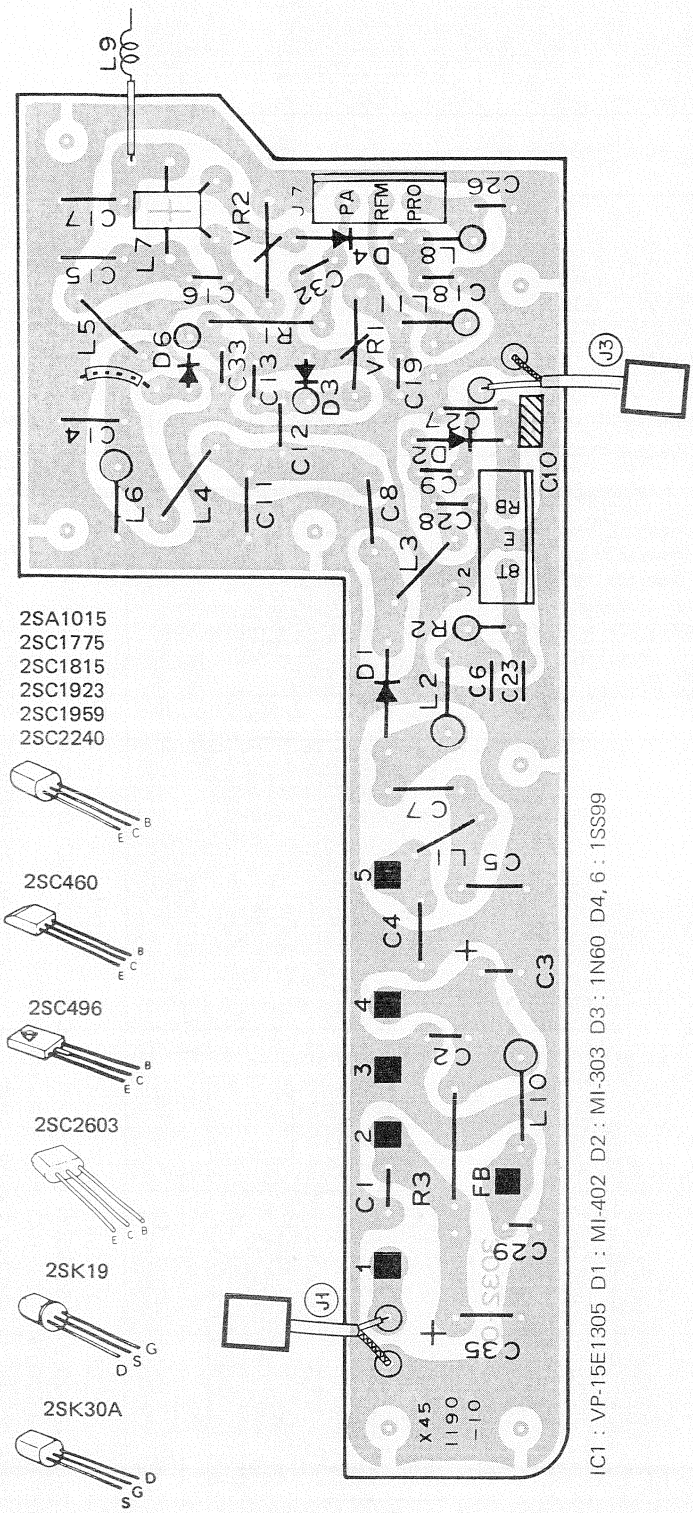
< Attachment direction of IC4 >



	T	W
D22	Used	Not used
VR8	Used	Not used
C129, 131	Used	Not used

TR-7730 PC BOARD VIEWS

▼FINAL UNIT (X45-1190-10) Components side view



IC1 : VP-15E1305 D1 : MI-402 D2 : MI-303 D3 : 1N60 D4, 6 : 1SS99

2SA1015
2SC1775
2SC1815
2SC1923
2SC1959
2SC2240

2SC460

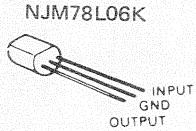
2SC496

2SC2603

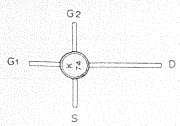
2SK19

2SK30A

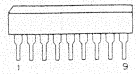
NJM78L06K



3SK74

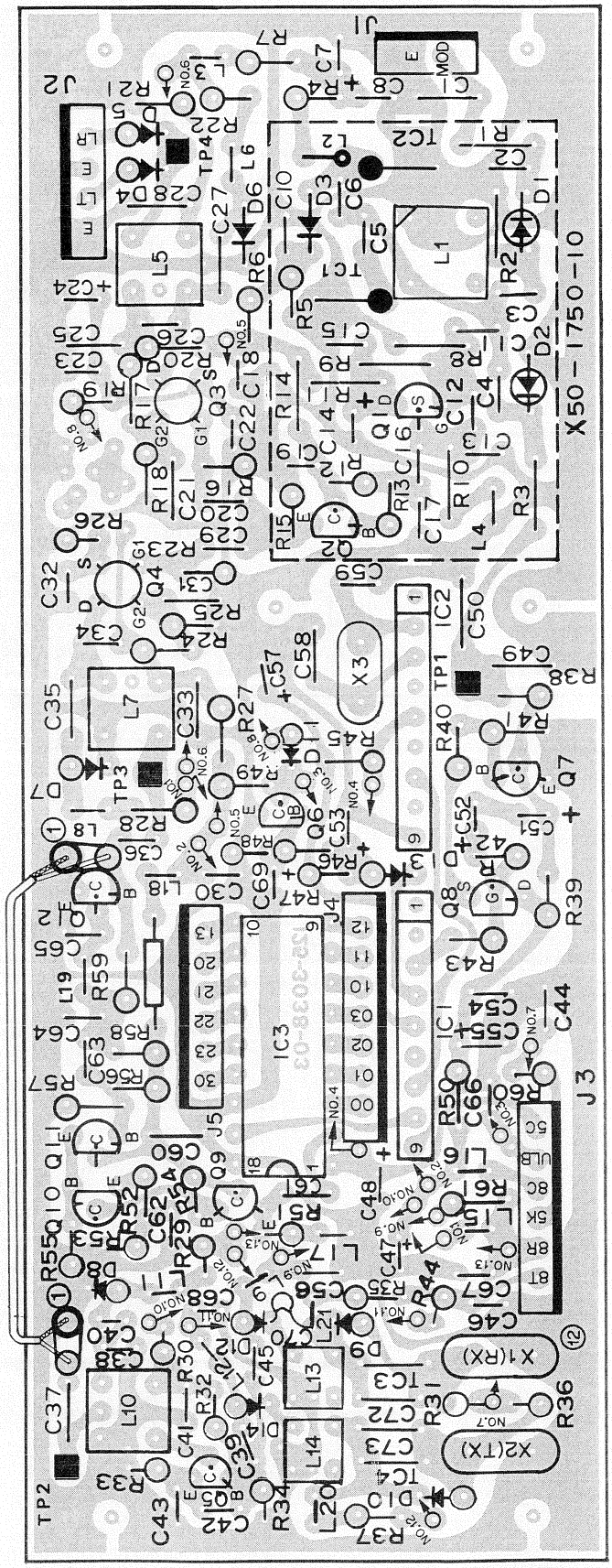


TC5081P
TC5082P-GL



Transistor terminal indication

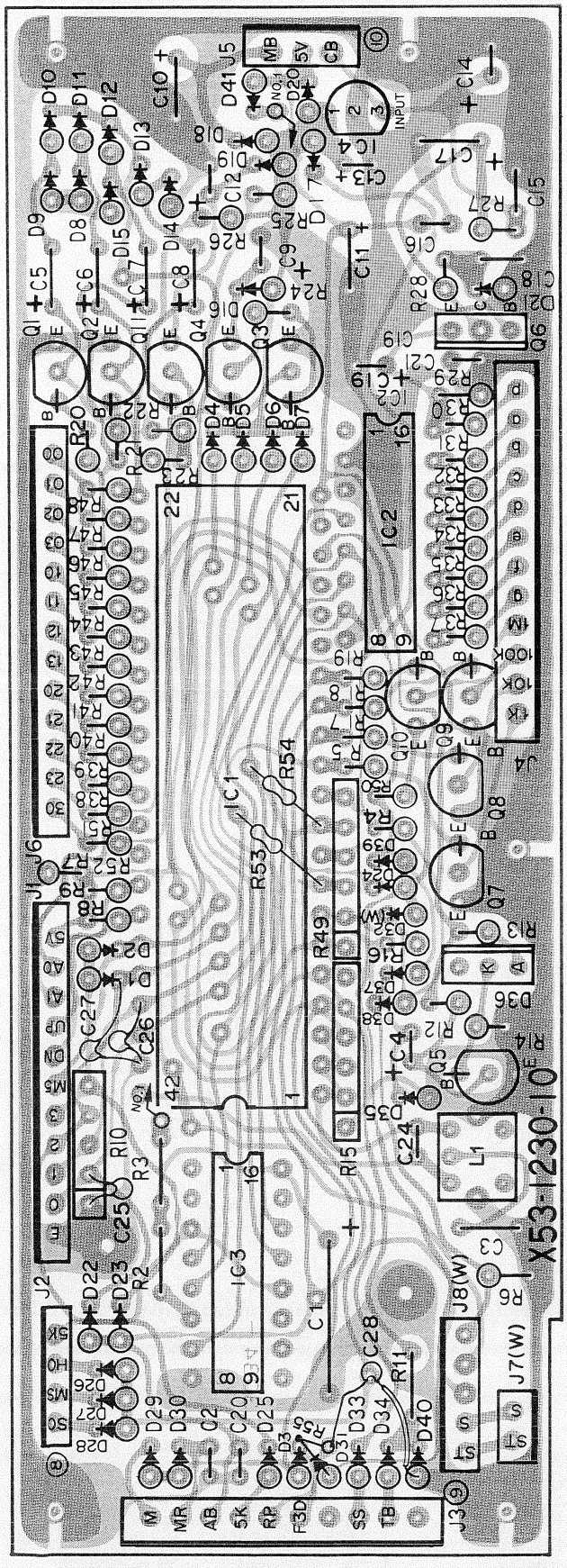
▼PLL UNIT (X50-1750-10) Components side view



Q1 : 2SK19(GR) Q2, 12 : 2SC1923(O) Q3, 4 : 3SK74(L)
Q5, 9~11 : 2SC460(B) Q6 : 2SC1775(E) Q7 : 2SC2240(GR)
Q8 : 2SK30A(O) IC1 : TC5081P IC2 : TC5082P-GL IC3 : TC9122P
D1, 2 : 1S2208 D3 : 1S2588 D4, 5, 9, 10, 12, 14 : BA243S
D6~8 : 1S1555 D11, 13 : 1N60

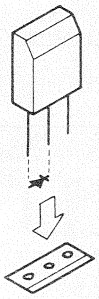
▼CONTROL UNIT (X53-1230-10, -61) -10 : K, M -61 : T, W

Components side view

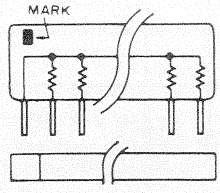


Q1~3, 5 : 2SC1815(Y) Q4, 11 : 2SA1015(Y) Q6 : 2SC496(Y)
Q7~10 : 2SC1959(Y) IC1 : μPD650C-078 IC2 : TC5022BP
IC3 : TC4042BP IC4 : NJM78L06K
D1~3, 8~15, 22~31, 33, 34 : 1N60
D4~7, 16~20, 35, 37~39, 41 : 1S1555 D21 : XZ-060
D32 : 1N60 (T, W only) D36 : MA522 (Q) D40 : XZ-090

< Attachment direction of D36 : MA522 >

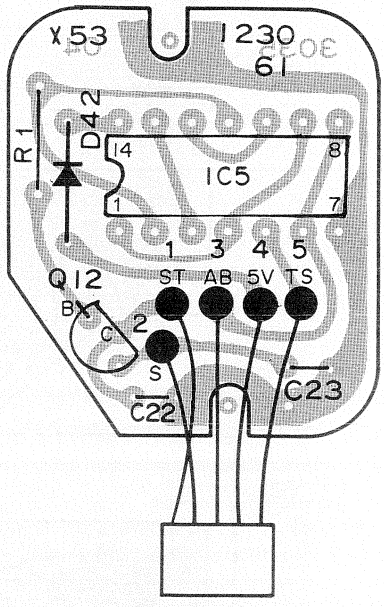


< Attachment direction of R10, 15, 49 >



▼CONTROL UNIT (X53-1230-61) T, W TYPE ONLY

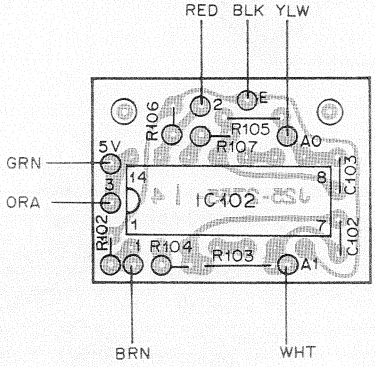
Components side view



Q12 : 2SC2603(E) IC5 : TC4011BP
D42 : 1N60

▼SCHMITT BOARD (J25-2755-14)

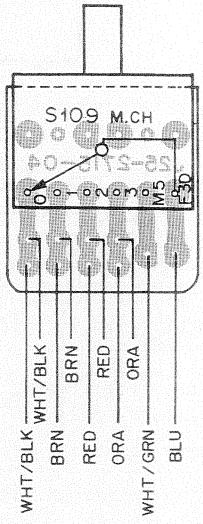
Components side view



IC102 : TC7404UBP

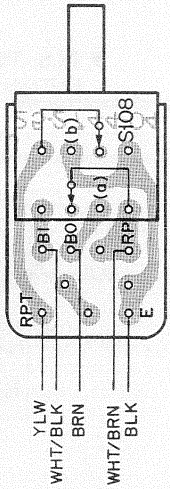
▼M. CH BOARD (J25-2715-04)

Components side view



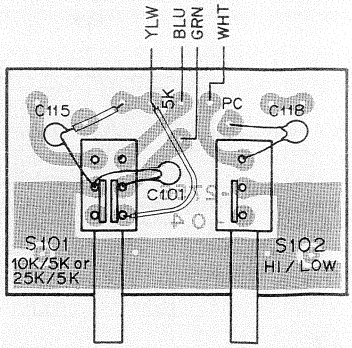
▼RPT BOARD (J25-2744-04)

Components side view



▼10k/5k or 25k/5k, HI/LOW BOARD (J25-2756-04)

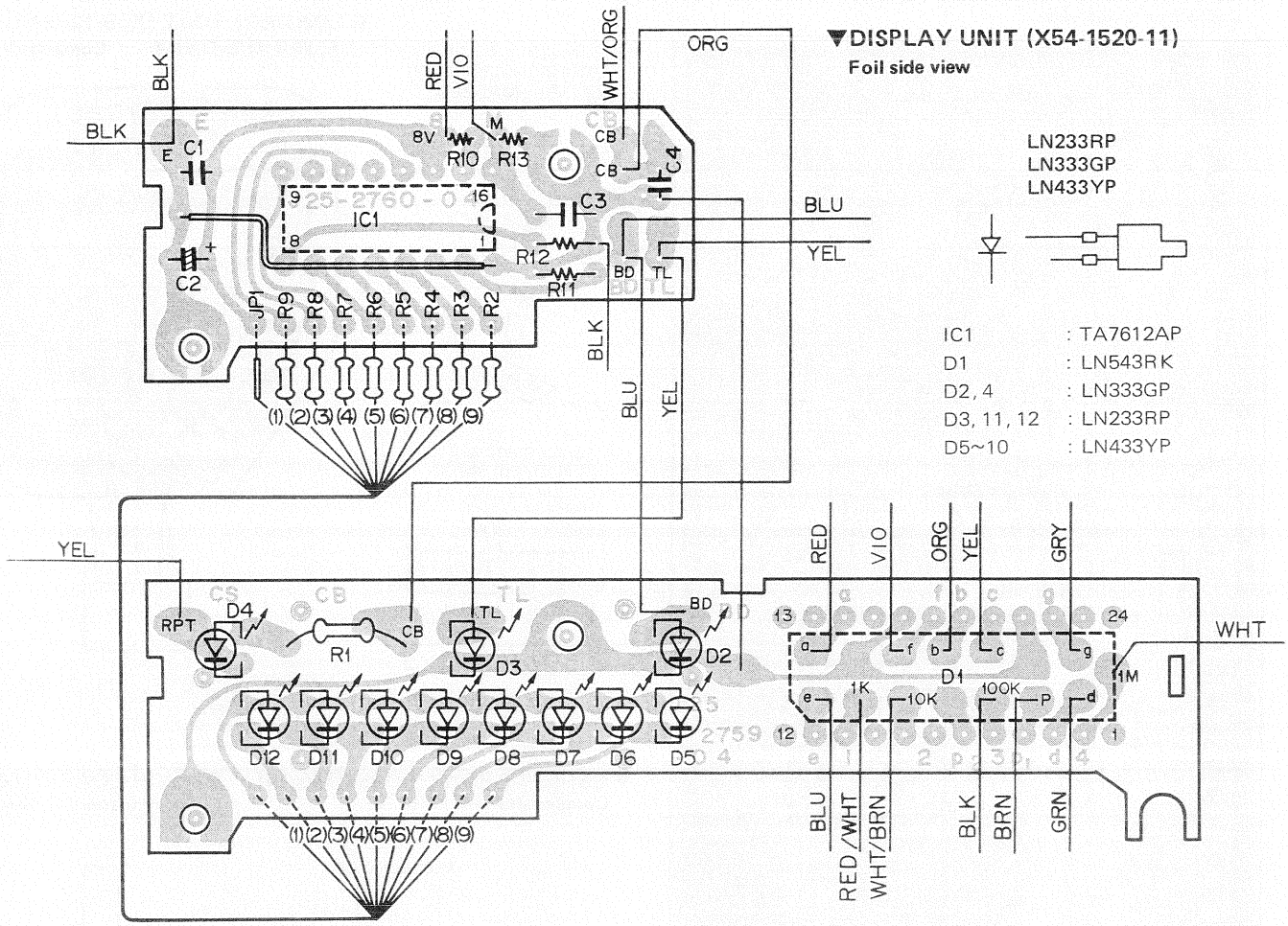
Components side view



TR-7730 PC BOARD VIEWS

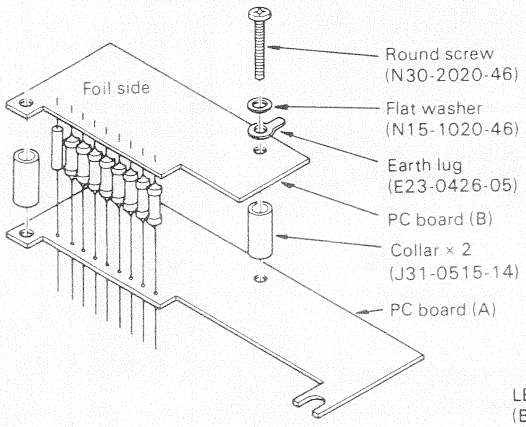
▼DISPLAY UNIT (X54-1520-11)

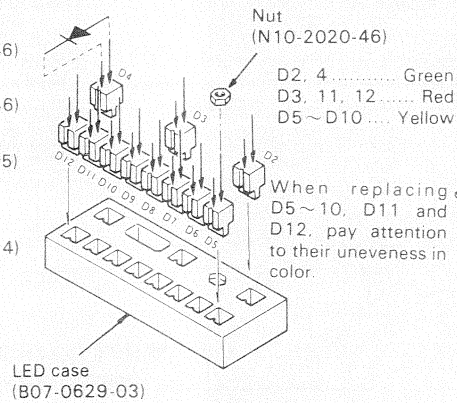
Foil side view

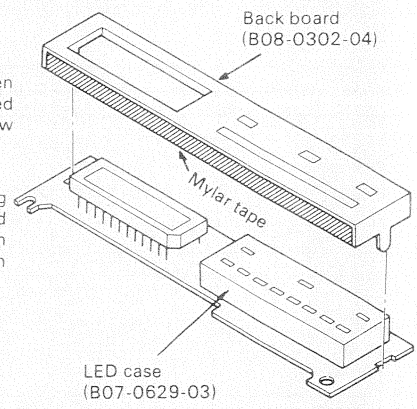


LN233RP
LN333GP
LN433YP

IC1	: TA7612AP
D1	: LN543RK
D2, 4	: LN333GP
D3, 11, 12	: LN233RP
D5~10	: LN433YP

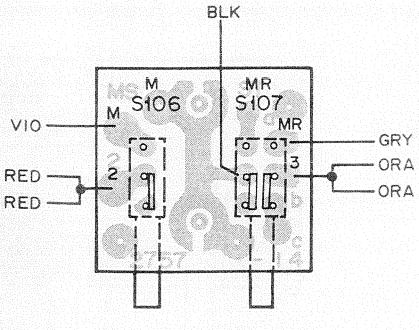






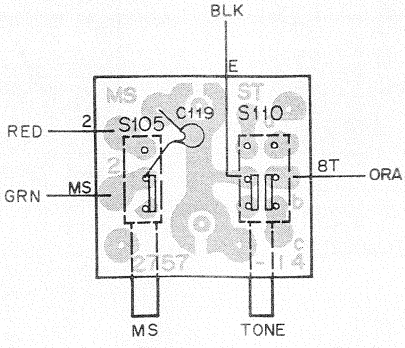
▼M, MR BOARD (J25-2757-14)

Foil side view



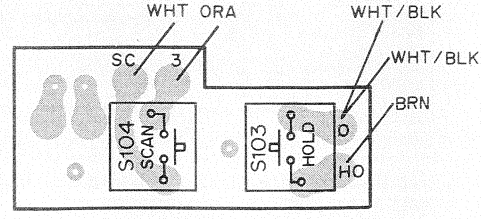
▼M.S, TONE BOARD (J25-2757-14)

Foil side view



▼SCAN, HOLD BOARD (J25-2758-14)

Components side view



PARTS LIST

Note 1:
K: U.S.A. T: Britain W: Europe X: Australia

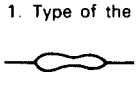
Note 2:
Only special type of resistors (example: cement, metal film, etc.) and capacitors (example: electrolytic, tantalum, mylar, temp. coeff, capacitors) are detailed in the PARTS LIST. For the value of all common type components, refer to the schematic diagram of the P.C. board illustration. Resistors not otherwise detailed are carbon type (1/4W or 1/8W).
Order carbon resistors and capacitors according to the following example:

A carbon resistor's part number is RD14BY 2E222J.

A ceramic capacitor's number is CK45F1H103Z, CC45TH1H220J.

RESISTOR

1. Type of the carbon resistor


RD14BY
RD14BB (small size)


RD14CY
RD14CB (small size)

2. Wattage

1W → 3A 3W → 3F 5W → 3H
2W → 3D 4W → 3G

3' = CC45 ○ ○ ...
Ceramic capacitor (type I) temperature coeff. capacitor 1' 3'

1st word (Color)	C (Black)	L (Red)	P (Orange)	R (Yellow)	S (Green)	T (Blue)	U (Violet)
ppm/°C	0	−80	−150	−220	−330	−470	−750

3 = CK45 ○
Ceramic capacitor (type II) 3

Cord	B	D	E	F
Operating temperature °C	−30 +85	−30 +85	−30 +85	−10 +70

6 = Tolerance

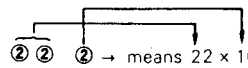
Cord	C	D	G	J	K	M	X	Z	P	No cord
(%)	±0.25	±0.5	±2	±5	±10	±20	+40 −20	+80 −20	+100 −0	More than 10 μF −10 ~ +50 Less than 4.7 μF −10 ~ +75

Less than 10 pF

Cord	B	C	D	F	G
(pF)	±0.1	±0.25	±0.5	±1	±2

Abbreviation		Abbreviation	
Cap.	Capacitor	ML	Mylar
C	Ceramic	S	Styren
E	Electrolytic	T	Tantalum
MC	Mica		

3. Resistance value



Example 221 → 220Ω 223 → 22 kΩ 225 → 2.2 MΩ
222 → 2.2 kΩ 224 → 220 kΩ

4. Tolerance
J = ±5% (Gold) K = ±10% (Silver)

CAPACITORS

Type I

CC	45	TH	1H	220	J
1'	2	3'	4	5	6

Type II

CK	45	F	1H	103	Z
1	2	3	4	5	6

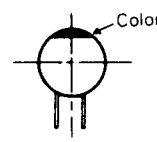
1 = Type ..... ceramic, electrolytic, etc.
2 = Shape ..... round, square, etc.
3 = Temp range
3' = Temp coefficient
4 = Voltage rating
5 = Value
6 = Tolerance

Ex. CC45TH = −470 ±60 ppm/°C

2nd Word	G	H	J	K	L
ppm/°C	±30	±60	±120	±250	±500

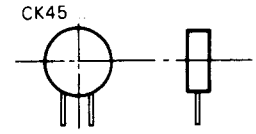
5 = Capacitor value
Example: 010 → 1 pF
100 → 10 pF
101 → 100 pF
102 → 1000 pF = 0.001μF
103 → 0.01 μF

CC45



Type I

CK45


Type II

TR-7730 SEMICONDUCTOR

☆: New parts

Item	Name	Re-marks	Parts No.
Diode	1N60		V11-0051-05
	1S1555		V11-0076-05
	1S2588		V11-0414-05
	1SS99		V11-1277-86
	BA243S		V11-7767-06
	MA522 (Q)		V11-1173-46
	MI303		V11-5273-66
	MI402		V11-5260-16
	U05B		V11-0270-05
Vari-Cap	1S2208		V11-0317-05
Varistor	1S1212		V11-1262-06

Item	Name	Re-marks	Parts No.	
Zener diode	WZ-040		V11-4102-50	
	XZ-060		V11-4101-20	
	XZ-070		V11-4161-96	
	XZ-090		V11-4167-06	
	XZ-100		V11-4104-10	
LED	LN233RP		V11-1173-06	Red
	LN333GP		V11-1173-16	Green
	LN433YP		V11-1173-26	Amber
	LN543RK		V11-1173-36	4 Digit
Thermistor	D33A		V11-3161-86	

PARTS LIST

Item	Name	Re-marks	Parts No.
TR	2SA562TM (Y)		V01-0562-16
	2SA1015 (Y)		V01-1015-06
	2SA1115 (E)		V01-1115-16
	2SC458 (B)		V03-0093-05
	2SC460 (B)		V03-0079-05
	2SC496 (Y)		V03-0336-05
	2SC1775 (E)		V03-1775-06
	2SC1815 (Y)		V03-1815-06
	2SC1923 (O)		V03-1923-06
	2SC1959 (Y)		V03-1959-06
	2SC2240 (GR)		V03-2240-06
	2SC2538		V03-2538-06
	2SC2603 (E)		V03-2603-06
FET	2SK19 (GR) TRIO-5		V09-1001-16
	2SK30A (O)		V09-0056-05
	3SK74 (L)		V09-1002-56
	3SK76		V09-1012-06
	3SK92		V09-1006-16
Power module	VP-15E1305	☆	V30-1240-26
IC	HA1366W		V30-1045-06
	NJM78L06K		V30-1067-06
	TA7061AP		V30-0039-05
	TA7302P		V30-1134-06
	TA7612AP		V30-1169-06
	TC4011BP		V30-0301-70
	TC4042BP		V30-1052-06
	TC5022BP		V30-1054-06
	TC5081P		V30-1132-06
	TC5082P-GL		V30-1147-06
	TC7404UBP		V30-1028-06
	TC9122P		V30-1036-16
	μPC78L08A		V30-1030-26
	μPC78M08H		V30-1222-16
Micro-processor	μPD650C-078		V30-1219-16

Ref. No.	Parts No.	Re-marks	Description
TR-7730 GENERAL			
	A01-0905-03	☆	Case (upper)
	A01-0906-03	☆	Case (lower)
	A13-0618-22		Angle ass'y (accessary)
	A20-2433-04	☆	Panel
	B01-0639-03	☆	Panel escutcheon K, M
	B01-0640-03	☆	Panel escutcheon T
	B01-0641-03	☆	Panel escutcheon W
	B03-0517-04		Switch mask x 2 M, MR
	B03-0518-04		Switch mask x 4 5k/10k, H/L, TONE, MS
	B05-0714-04		SP grill cloth
	B07-0636-04	☆	Side escutcheon x 2
	B10-0629-04		Front glass
	B40-2571-04	☆	Model name plate K, M
	B40-2572-04	☆	Model name plate T
	B40-2573-04	☆	Model name plate W
	B46-0058-10		Warranty card K
	B50-3911-00	☆	Operating manual K, M
	B50-3912-00	☆	Operating manual T
	B50-3913-00	☆	Operating manual W
C101	CC45SL1H470J		C 47pF
C102, 103	C91-0430-05		Lamineted cap. 0.047μF
C104~113	C91-0469-05		Cap. 0.001μF
C115, 118, 119	CC45SL1H470J		C 47pF
	E06-0651-05		6P male socket MIC
	E07-0651-05		6P metal plug MIC
	E12-0001-05		Phone plug (accessary)
	E30-1689-05	☆	DC cord (C) (accessary)
	E31-2074-15		Connector with lead (B)
	F05-6021-05		Fuse 6A (accessary)
	G02-0518-04		Gnd spring (C) x 2 Helical
	G10-0607-04		Cushion cloth x 4 120 x 4 mm
	G10-0611-04		Cushion cloth (B) 30 x 13 mm
	G10-0612-04		Cushion cloth (C) 150 x 45 mm
	G10-0613-14		Cushion cloth (D) 140 x 24 mm
	G10-0615-04	☆	Cushion cloth (E) x 2 73 x 15 mm Case
	G13-0638-04		Cushion (A) x 2 53 x 24 x 5 mm
	G16-0503-03		Conductive rubber sheet
	H01-2760-03	☆	Carton case (inside) K, M, W
	H01-2761-03	☆	Carton case (inside) T
	H10-2536-04		Packing fixture (B)
	H10-2551-02	☆	Packing fixture (A)
	H12-0474-04		Cushion
	H20-1417-03		Protective cover
	H25-0029-04		Protective bag Boss
	H25-0049-03		Accessary bag
	H25-0079-04		Protective bag MIC
	H25-0103-04		Protective bag Cord
	J02-0022-05		Foot x 2 (accessary) Rear
	J02-0420-04		Foot (accessary) Front
	J21-2676-04		Foot mounting hardware x 2 (accessary)
	J25-2715-04		PC board M. CH
	J25-2744-04		PC board (E) RPT
	J25-2755-14		PC board (A) Schmitt
	J25-2756-04		PC board (B) 10k/5k, H/L
	J25-2757-14		PC board (C) M/MR, M.S/TONE
	J25-2758-14		PC board (D) SCAN, HOLD
	J32-0748-04		Boss x 4 (accessary)
	K21-0752-03		Main knob
	K23-0736-04		Knob (A) x 2 VOL, SQU
	K23-0737-04		Knob (B) M. CH
	K23-0743-04		Knob (C) RPT
	K27-0416-05		Push knob (A) M
	K27-0417-05		Push knob (B) MR
	K27-0418-05		Push knob (C) x 3 10k/5k, H/L, TONE

PARTS LIST

Ref. No.	Parts No.	Re-marks	Description
	K27-0419-05		Push knob (D) MS
	K27-0420-04		Push knob (E) x 2 SCAN, HOLD
	N09-0008-04		Round screw x 4 Angle (accessary)
	N13-0302-04		Ornamental nut M. CH
	N14-0510-04		Flange nut x 4 Angle (accessary)
	N14-0512-05		Speed nut x 3
	N15-1020-46		Flat washer x 2
	N15-1060-46		Flat washer x 4 Angle (accessary)
	N16-0060-46		Spring washer x 4 Angle (accessary)
	N30-2004-46		Round screw x 20
	N30-2020-46		Round screw
	N30-2604-46		Round screw x 23
	N30-3004-46		Round screw x 5
	N30-3006-46		Round screw
	N32-2604-46		Flat screw x 7
	N32-2606-45		Flat screw x 4
	N33-2605-45		Round flat screw x 13
	N33-2606-45		Round flat screw x 10
	N35-3006-45		Bind screw x 6 (accessary)
	N35-3012-45		Bind screw x 4 (accessary)
VR101	R05-3410-15		Pot. 10kΩ (A) with SW VOL
VR102	R05-4405-05		Pot. 50kΩ (B) SQU
	S01-1421-05		Rotary switch RPT
	S01-1422-05		Rotary switch M. CH
	S40-1401-05		Push switch x 2 MS, H/L
	S40-1402-05		Push switch M
	S40-2417-05		Push switch x 2 10k/5k, MR
	S40-2417-05		Push switch TONE K, M, T
	S40-2421-05		Push switch TONE W
	S50-1406-05		Tact switch x 2
	S59-1405-05		Key board switch x 2 SCAN, HOLD
	T07-0216-05		Speaker
	T91-0311-05		Microphone T
	T91-0313-05		Microphone K, M, W
	W02-0316-05		Rotary encoder
	X44-1450-10	☆	RX.TX unit K, M
	X44-1450-51	☆	RX.TX unit T
	X44-1450-61	☆	RX.TX unit W
	X45-1190-10	☆	Final unit
	X50-1750-10	☆	PLL unit
	X53-1230-10	☆	Control unit K, M
	X53-1230-61	☆	Control unit W, T
	X54-1520-11		Display unit

RX.TX UNIT (X44-1450-10, -51, -61) **-10 : K, M -51 : T -61 : W**

C1	CC45CH1H220J		C	22pF	
C4, 5, 7	C91-0131-05		C	0.01μF	
C8	CC45CH1H060D		C	6pF	±0.5pF
C11	CE04W1C100M		E	10μF	16V
C13	CC45CH1H220J		C	22pF	
C16	CC45SL1H101J		C	100pF	
C19	C91-0131-05		C	0.01μF	
C20	CC45CH1H180J		C	18pF	
C21	CC45CH1H050C		C	5pF	±0.25pF
C22	CC45CH1H220J		C	22pF	
C23	CC45CH1H0R5C		C	0.5pF	±0.25pF

Ref. No.	Parts No.	Re-marks	Description			
C25	C91-0131-05		C	0.01μF		
C26	CC45CH1H050C		C	5pF	±0.25pF	
C30	CC45SL1H151J		C	150pF		
C32	CC45CH1H150J		C	15pF		
C33	CQ92M1H393K		ML	0.039μF	50V	
C34	CQ92M1H223K		ML	0.022μF	50V	
C35	CE04W1A101M		E	100μF	10V	
C36, 37	CQ92M1H473K		ML	0.047μF	50V	
C38	CQ92M1H393K		ML	0.039μF	50V	
C39	CQ92M1H103K		ML	0.01μF	50V	
C41~43	CQ92M1H223K		ML	0.022μF	50V	
C47	CC45SL1H470J		C	47pF		
C50, 53	CQ92M1H222K		ML	0.0022μF	50V	
C54	CQ92M1H473K		ML	0.047μF	50V	
C55	CQ92M1H102K		ML	0.001μF	50V	
C56	CQ92M1H223K		ML	0.022μF	50V	
C57	CQ92M1H222K		ML	0.0022μF	50V	
C58	CQ92M1H332K		ML	0.0033μF	50V	
C59	CQ92M1H222K		ML	0.0022μF	50V	
C60	CQ92M1H393K		ML	0.039μF	50V	
C61, 62	CQ92M1H223K		ML	0.022μF	50V	
C63	CE04W1A470M		E	47μF	10V	
C64	CS15E1A220M		T	22μF	10V	
C65	CQ92M1H103K		ML	0.01μF	50V	
C66	CQ92M1H392K		ML	0.0039μF	50V	
C67	CS15E1V0R1M		T	0.1μF	35V	
C68	CC45CH1H220J		C	22pF		
C69	CQ92M1H103K		ML	0.01μF	50V	
C70	CC45CH1H220J		C	22pF		
C71	CS15E1A100M		T	10μF	10V	
C72	CQ92M1H332K		ML	0.0033μF	50V	
C73, 74	CS15E1C3R3M		T	3.3μF	16V	
C75	CS15E1C4R7M		T	4.7μF	16V	
C78	CS15E1V0R1M		T	0.1μF	35V	
C79	CE04W1A330M		E	33μF	10V	
C81	CS15E1V0R1M		T	0.1μF	35V	
C82	CE04W1A220M		E	22μF	10V	
C83	CS15E1C4R7M		T	4.7μF	16V	
C84	CE04W1A330M		E	33μF	10V	
C85	CE04W1H010M		E	1μF	50V	
C86	CQ92M1H103K		ML	0.01μF	50V	
C88	CQ92M1H473K		ML	0.047μF	50V	
C89	C91-0131-05		C	0.01μF		
C90	CE04W1H010M		E	1μF	50V	
C91	CQ92M1H332K		ML	0.0033μF	50V	
C92	CE04W1A101M		E	100μF	10V	
C93	CE04W1A470M		E	47μF	10V	
C94	CQ92M1H102K		ML	0.001μF	50V	
C95	CC45SL1H101J		C	100pF		
C96	CE04W1A470M		E	47μF	10V	
C97	CE04W1A101M		E	100μF	10V	
C98	CQ92M1H104K		ML	0.1μF	50V	
C99	CE04W1H010M		E	1μF	50V	
C100, 101, 103	CE04W1A470M		E	47μF	10V	
C105, 106	C90-0820-05		E	470μF	16V	
C107	C91-0131-05		C	0.01μF		
C109	CE04W1C100M		E	10μF	16V	
C111	CE04W1A470M		E	47μF	10V	
C113, 115	CE04W1C100M		E	10μF	16V	
C116~118	CQ92M1H392K		ML	0.0039μF	50V	W, T
C119	CE04W1H010M		E	1μF	50V	W, T
C120, 121	CS15E1A220M		T	22μF	10V	W, T
C126	CC45SL1H101J		C	100pF		
C127	CE04W1H010M		E	1μF	50V	W, T

PARTS LIST

Ref. No.	Parts No.	Re-marks	Description
C129	CS15E1A150M		T 15μF 10V T
C130	C91-0131-05		C 0.01μF
C131	CS15E1A150M		T 15μF 10V T
C132	CE04W1HR47M		E 0.47μF 50V
C139~141	C91-0131-05		C 0.01μF
TC1	C05-0030-15		Ceramic trimmer 20pF
	E23-0046-04		Square terminal x 3
J1~5	E40-0273-05		Mini connect wafer 2P
J6	E40-0673-05		Mini connect wafer 6P
J7	E40-0773-05		Mini connect wafer 7P
J8	E40-0273-05		Mini connect wafer 2P
J9	E40-1173-05		Mini connect wafer 11P
J10	E40-0873-05		Mini connect wafer 8P
J11	E40-0673-05		Mini connect wafer 6P
J12	E40-0273-05		Mini connect wafer 2P
L1	L33-0002-05		Choke coil 1μH
L2	L34-0948-05		Tuning coil
L3	L34-0452-05		VHF coil 3φ 6T
L4	L34-0691-05		VHF coil 5φ 5T
L5	L79-0482-05	☆	Helical resonator (A) 4 MHz 2pole
L6	L79-0483-05	☆	Helical resonator (B) 4 MHz 3pole
L7, 8	L30-0281-05		IFT 10.7 MHz
L10	L30-0504-05		IFT 455 kHz
L11	L30-0503-05		IFT 455 kHz
L12	L40-6825-04		Ferri-inductor 6.8mH
L13	L40-1021-03		Ferri-inductor 1mH
L14	L40-1541-27		Ferri-inductor 150mH
L15	L15-0016-05		Choke trans.
L16	L40-1511-03		Ferri-inductor 150μH
L17 (A), (B)	L71-0219-05		MCF 10.7 MHz
L18	L72-0315-05		Ceramic filter CFW455F
L19	L79-0446-05		Ceramic discri CFY455S
L20	L34-0683-05		Tuning coil
X1	L77-0327-05		Crystal 10.245 MHz
	N30-3008-11		Round screw x 2 IC
R96	R92-0616-05		Metal film 10kΩ ±1% 1/4W W, T
R101	RC05GF2H5R6J		Solid 5.6Ω 1/2W
R107	R92-0616-05		Metal film 10kΩ ±1% 1/4W W, T
R108	RN14BK2E4703F		Metal film 470kΩ ±1% 1/4W W, T
R126	R92-0617-05		Metal film 7.5kΩ ±1% 1/4W W, T
VR1	R12-4016-05		Trim. pot 50kΩ (B)
VR2	R12-1020-05		Trim. pot 1kΩ (B)
VR3	R12-1414-05		Trim. pot 1kΩ (B)
VR4	R12-1020-05		Trim. pot 1kΩ (B)
VR5~7	R12-1405-05		Trim. pot 3kΩ (B)
VR8	R12-4403-05		Trim. pot 50kΩ T
VR9	R12-2409-05		Trim. pot 5kΩ W, T
	R92-0150-05		Short jumper

FINAL UNIT (X45-1190-10)

C3	CE04W1C101M		E 100μF 16V
C4, 5	CC45SL2H070D		C 7pF ±0.5pF 500V
C7, 8	CC45SL2H101J		C 100pF 500V
C9	CC45CH1H150J		C 15pF

Ref. No.	Parts No.	Re-marks	Description
C10	C91-0466-05		Cap. 0.001μF
C11	CC45SL2H330J		C 33pF 500V
C12	CC45CH1H0R5C		C 0.5pF ±0.25pF
C13	CC45CH1H030C		C 3pF ±0.25pF
C14	CC45SL2H330J		C 33pF 500V
C15	CC45SL2H100D		C 10pF ±0.5pF 500V
C16	CC45CH1H0R5C		C 0.5pF ±0.25pF
C17	CC45SL2H220J		C 22pF 500V
C19	C91-0131-05		C 0.01μF
C21	CC45SL2H150J		C 15pF 500V
C30, 31	CC45SL1H101J		C 100pF
C35	CE04W1C221M		E 220μF 16V
J1	E31-2093-05	☆	Coax. connector with 2P lead
J2	E40-0373-05		Mini connect wafer 3P
J3	E31-2093-05	☆	Coax. connector with 2P lead
J4	E04-0152-05		UHF type receptacle
J5	E11-0403-05		Phone jack
J6	E08-0304-05		Power jack Backup
J7	E40-0373-05		Mini connect wafer 3P
	E23-0046-04		Square terminal x 6
	E30-1688-05	☆	DC cord (D) with 6A Fuse
	F01-0760-05	☆	Heat sink
	F05-6021-05		Fuse 6A
	J41-0006-05		Cord bushing DC cord
L1	L34-0951-05		Coil (A) 4φ 2.5T
L2	L34-0438-05		Coil 0.94μH
L3	L34-0952-05		Coil (B) 4φ 5.5T
L4, 5	L34-0953-05		Coil (C) 4φ 3.5T
L6	L33-0025-05		Choke coil 1μH
L7	L39-0409-05		Detector coil
L8	L33-0002-05		Choke coil 1μH
L9	L34-0955-15		Coil (E) 4φ 3.5T
L10	L33-0074-05		Heater choke
L11	L33-0002-05		Choke coil 1μH
	N30-2604-11		Round screw x 7
	N30-2606-11		Round screw x 2 Back up
	N35-3006-46		Bind screw x 2 Module
R3	R92-0144-05		Metal film 1Ω
VR1	R12-5024-05		Trim. pot 100kΩ (B)
VR2	R12-0053-05		Trim. pot 500Ω (B)

PLL UNIT (X50-1750-10)

C3	CC45CH1H0R5C		C 0.5pF ±0.25pF
C4	CC45TH1H080D		C 8pF ±0.5pF
C5	CC45CH1H020C		C 2pF ±0.25pF
C6	CC45CH1H050C		C 5pF ±0.25pF
C7	CE04W1A220M		E 22μF 10V
C11	CC45CH1H070D		C 7pF ±0.5pF
C12	CC45CH1H030C		C 3pF ±0.25pF
C13	CC45CH1H050C		C 5pF ±0.25pF
C14	CE04W1A101M		E 100μF 10V
C16	CC45CH1H040C		C 4pF ±0.25pF
C17	CC45CH1H010C		C 1pF ±0.25pF
C20	CC45CH1H220J		C 22pF
C22	C91-0131-05		C 0.01μF

PARTS LIST

Ref. No.	Parts No.	Re-marks	Description
C24	CE04W1H3R3M		E 3.3μF 50V
C26	CC45RH1H020C		C 2pF ±0.25pF
C27	CC45RH1H040C		C 4pF ±0.25pF
C29	CC45CH1H020C		C 2pF ±0.25pF
C32	C91-0131-05		C 0.01μF
C34	CC45RH1H020C		C 2pF ±0.25pF
C35	CC45RH1H030C		C 3pF ±0.25pF
C36, 37	CC45CH1H040C		C 4pF ±0.25pF
C38	CC45RH1H050C		C 5pF ±0.25pF
C40	CC45RH1H040C		C 4pF ±0.25pF
C41	C91-0131-05		C 0.01μF
C42	CC45CH1H390J		C 39pF
C43	CC45CH1H330J		C 33pF
C44, 46	C91-0131-05		C 0.01μF
C47	CE04W1A101M		E 100μF 10V
C48	CE04W1A470M		E 47μF 10V
C50	CQ92M1H473K		ML 0.047μF
C51, 52	CS15E1C100M		T 10μF 16V
C53	CS15E1V0R1M		T 0.1μF 35V
C54	CE04W1A101M		E 100μF 10V
C55	CQ92M1H223K		ML 0.022μF
C57	CE04W1A101M		E 100μF 10V
C58	CC45CH1H220J		C 22pF
C59	CC45CH1H270J		C 27pF
C60	CQ92M1H333K		ML 0.033μF
C61	CC45SL1H101J		C 100pF
C62	CQ92M1H153K		ML 0.015μF
C63	CC45SL1H101J		C 100pF
C64, 65	CC45CH1H100D		C 10pF ±0.5pF
C69	CS15E1VR22M		T 0.22μF 35V
C70	CC45CH1H020C		C 2pF ±0.25pF
C72, 73	CC45CH1H330J		C 33pF
TC1	C05-0062-05		Ceramic trimmer 6pF
TC2	C05-0308-05		Ceramic trimmer 4pF
TC3, 4	C05-0309-05		Ceramic trimmer 40pF
	E23-0046-04		Square terminal x 4
J1	E40-0273-05		Mini connect wafer 2P
J2	E40-0473-05		Mini connect wafer 4P
J3	E40-0673-05		Mini connect wafer 6P
J4	E40-0773-05		Mini connect wafer 7P
J5	E40-0673-05		Mini connect wafer 6P
L1	L32-0632-05		OSC coil
L2	L33-0637-05		Choke coil 3μH
L3	L40-6811-03		Ferri-inductor 680μH
L4	L40-3391-03		Ferri-inductor 3.3μH
L5	L34-0956-05		Tuning coil
L6	L40-2211-03		Ferri-inductor 220μH
L7	L34-0956-05		Tuning coil
L8	L40-2211-03		Ferri-inductor 220μH
L9	L40-1511-03		Ferri-inductor 150μH
L10	L31-0343-05		Tuning coil
L11	L40-2211-03		Ferri-inductor 220μH
L12	L40-1511-03		Ferri-inductor 150μH
L13, 14	L32-0637-05		OSC coil
L15	L40-2211-03		Ferri-inductor 220μH
L16	L40-4711-03		Ferri-inductor 470μH
L17	L40-1021-03		Ferri-inductor 1mH
L18	L40-4711-03		Ferri-inductor 470μH
L19	L40-2201-03		Ferri-inductor 22μH
L20, 21	L40-1001-03		Ferri-inductor 10μH

Ref. No.	Parts No.	Re-marks	Description
X1	L77-0944-05	☆	Crystal R 42.6000 MHz
X2	L77-0945-05	☆	Crystal T 46.1667 MHz
X3	L77-0720-05		Crystal 10.240 MHz
	R92-0150-05		Short jumper

CONTROL UNIT (X53-1230-10, -61)

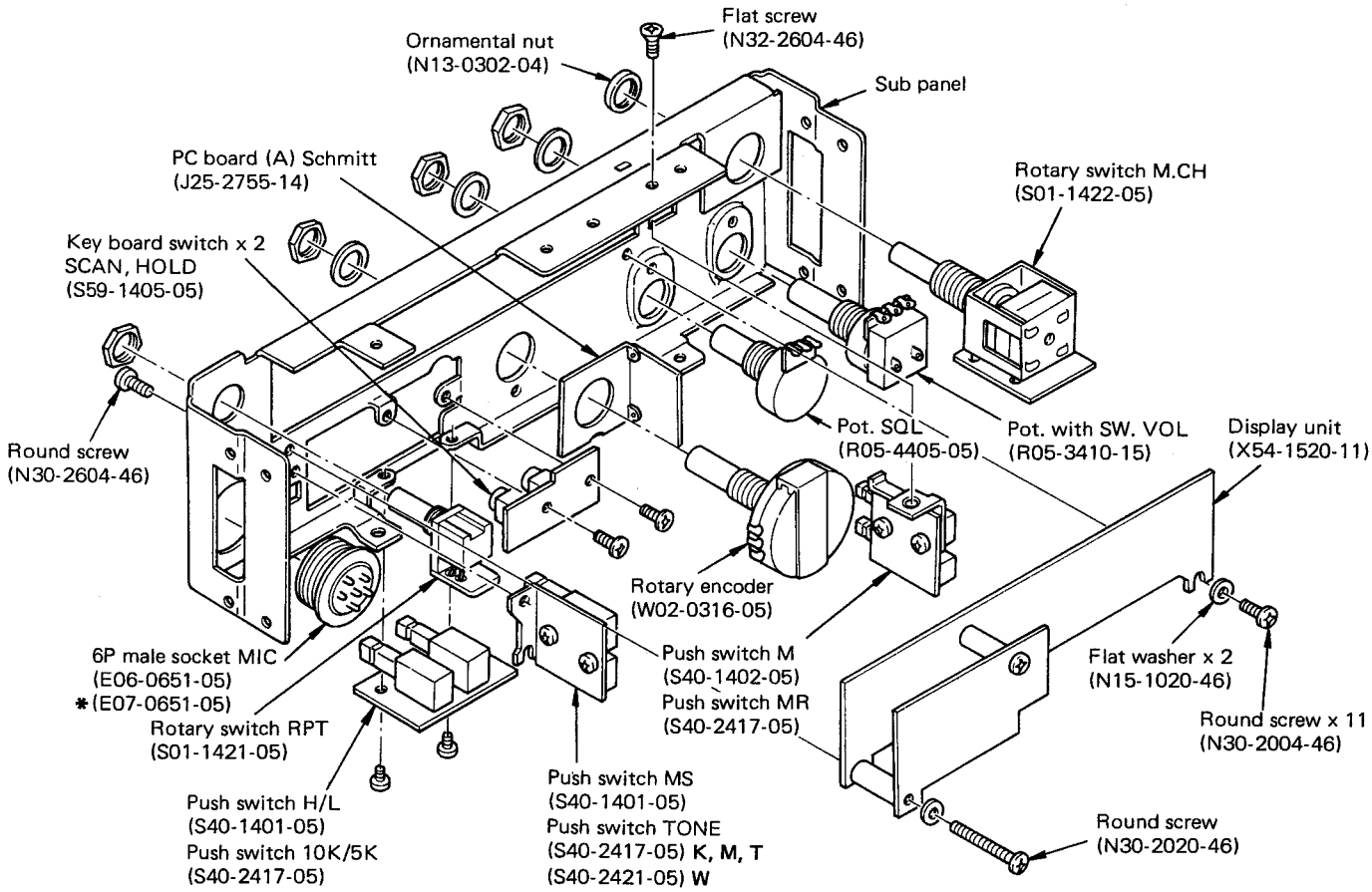
-10 : K, M
-61 : T, W

C1	CE02W0J470		E 47μF 6.3V	
C2	CC45SL1H470J		C 47pF	
C3	CQ92M1H223K		ML 0.022μF	
C4	CE04W1H010M		E 1μF 50V	
C5~8	CS15E1VR22M		T 0.22μF 35V	
C9	CE04W1C220M		E 22μF 16V	
C10, 11	CE04W0J471M		E 470μF 6.3V	
C12	CE04W1H2R2M		E 2.2μF 50V	
C13	CE04W1A470M		E 47μF 10V	
C14	CE04W1C470M		E 47μF 16V	
C15	C91-0131-05		C 0.01μF	
C17	C90-0827-05		E 330μF 16V	
C18	C91-0131-05		C 0.01μF	
C19	CE04W1A101M		E 100μF 10V	
C20	CC45SL1H470J		C 47pF	
C24	CC45CH1H270J		C 27pF	
C25~28	CC45SL1H470J		C 47pF	
	E31-2098-05	☆	Connector with lead	W, T
J1	E40-1173-05		Mini connect wafer 11P	
J2	E40-0473-05		Mini connect wafer 4P	
J3	E40-1073-05		Mini connect wafer 10P	
J4	E40-1273-05		Mini connect wafer 12P	
J5	E40-0373-05		Mini connect wafer 3P	
J6	E40-1373-05		Mini connect wafer 13P	
J7	E40-0273-05		Mini connect wafer 2P	W, T
J8	E40-0573-05		Mini connect wafer 5P	W, T
	J31-0503-05		Bead x 8	
	J32-0755-04	☆	Round boss x 2	W, T
L1	L30-0503-05		IFT 455 kHz	
	N30-2606-46		Round screw x 4	W, T
R10	R90-0526-05		Resistor block 27kΩ x 4	
R15, 49	R90-0520-05		Resistor block 47kΩ x 5	

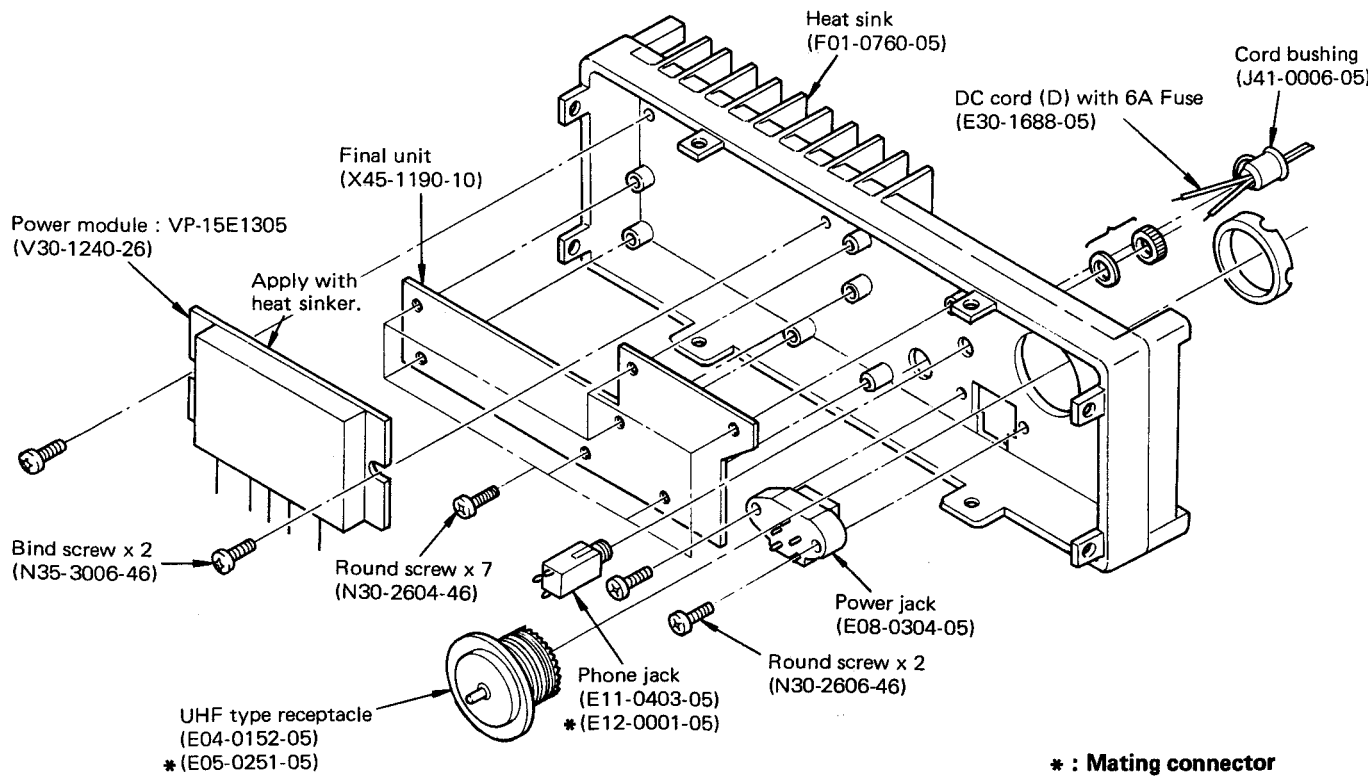
DISPLAY UNIT (X54-1520-11)

	B07-0629-03		LED case
	B08-0302-04		Back board
C2	CE04W1C100M		E 10μF 16V
	E23-0426-05		Earth lug φ2
	J31-0515-14		Collar
	N10-2020-46		Nut
	N15-1020-46		Flat washer
	N30-2020-46		Round screw
	R92-0150-05		Short jumper

DISASSEMBLY

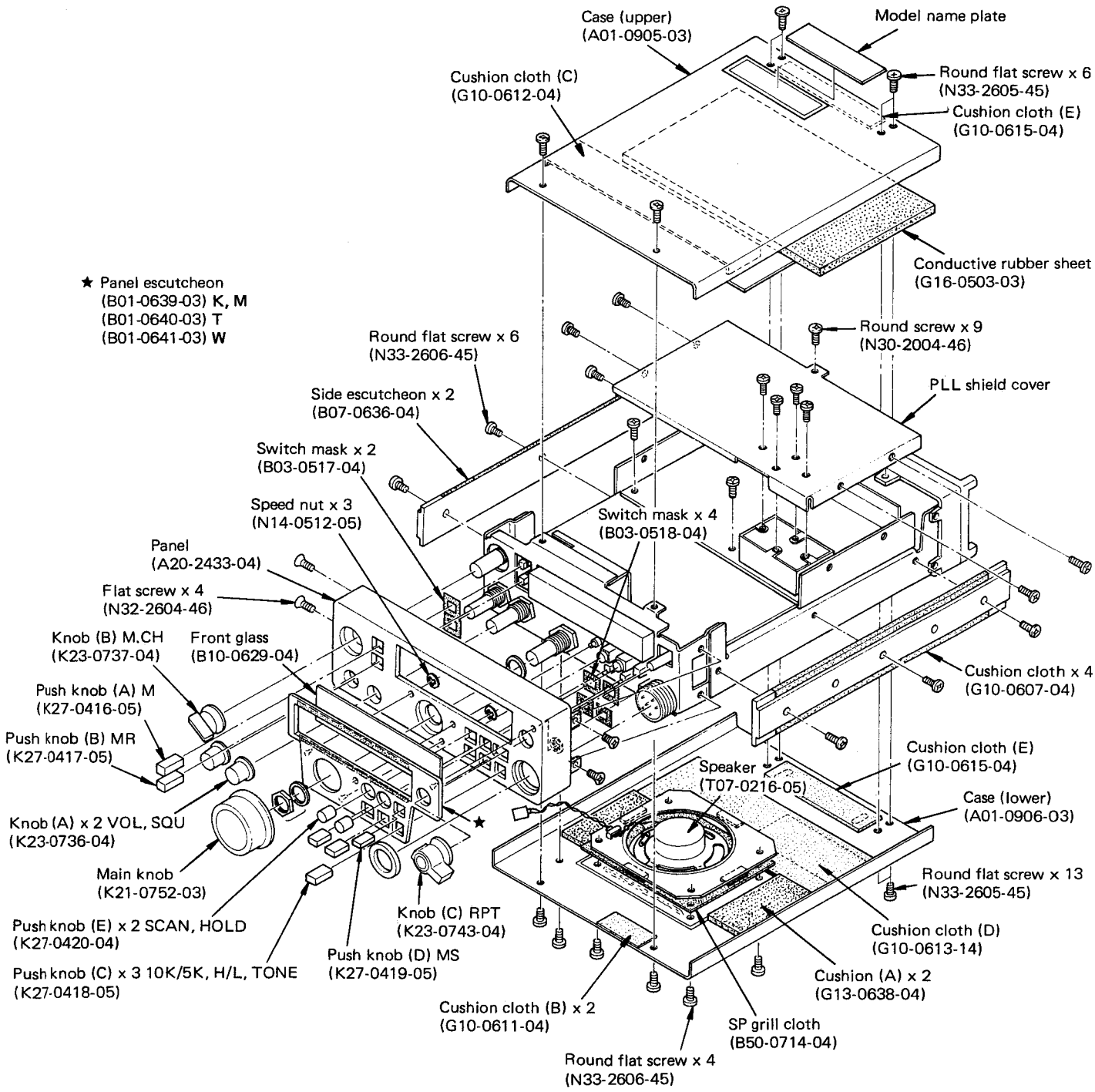


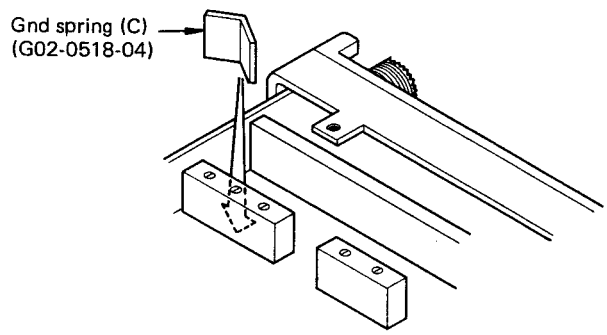
* : **Mating connector**

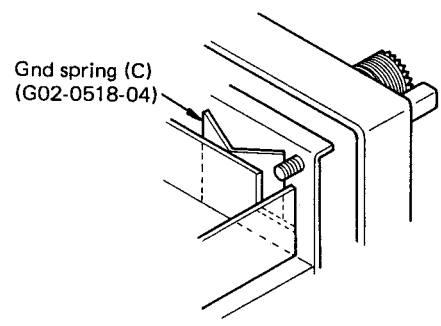


* : **Mating connector**

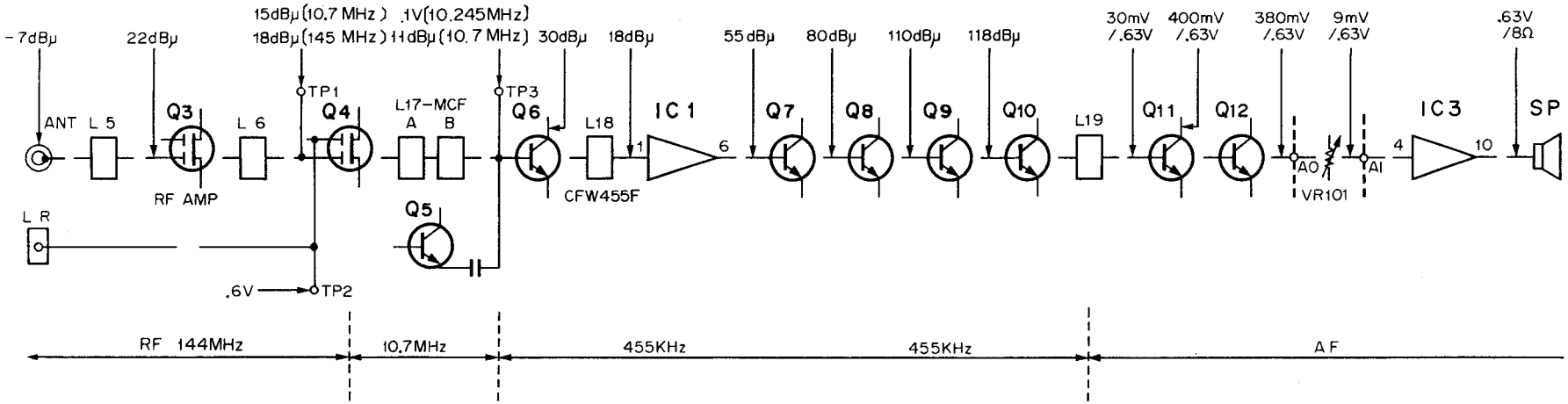
DISASSEMBLY







RECEIVER SECTION

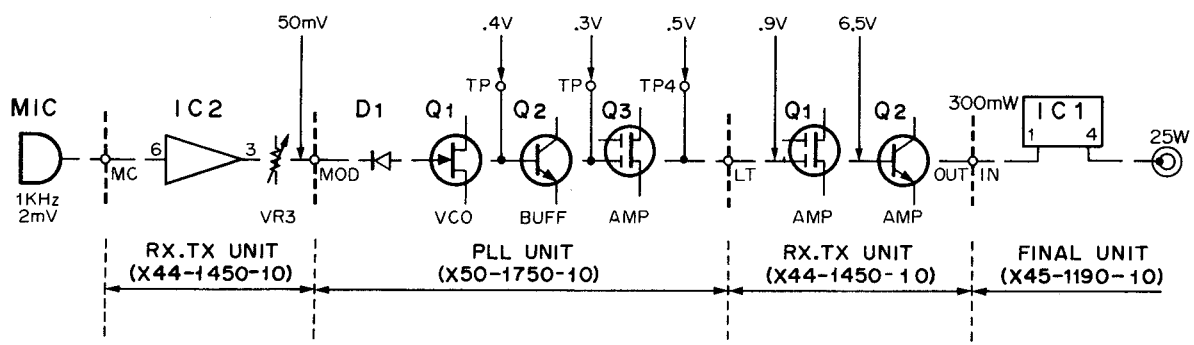


Notes : 1. To inject signal generator output connect a 0.01μF capacitor between the signal genetator and the check point.

2. In measuring the circuit from the ANT terminal to the base of Q10, unmodulated 144 MHz, 10.7 MHz, and 455 kHz signals from an SSG are applied to the check point to obtain a 20 dB NQ sensitivity.

3. In measuring the circuit from the base of Q11 to the SP terminal, an SSG signal of 144 MHz, 0 dBμ, 1 kHz MOD, 5 kHz DEV is applied to the ANT terminal, and the AF control is adjusted to obtain an AF output of 0.63 V/8Ω. The signal voltage at each point is measured with an AF VTVM.

TRANSMITTER SECTION



Notes : 1. Voltages in MIC AMP are measured by an AF VTVM with an input of 1 kHz, 2 mV.

2. Voltage measurements before OUT terminal are read from an RF VTVM with OUT cable disconnected at HI power position.

< REFERENCE >

Japanese "SG"	American "SG"
−6 dB	0.25 μV
0 dB	0.5 μV
6 dB	1 μV
12 dB	2 μV
24 dB	8 μV
30 dB	15.8 μV
40 dB	50 μV
50 dB	158 μV
60 dB	500 μV
70 dB	1.58 mV
80 dB	5 mV
90 dB	15.8 mV
100 dB	50 mV
120 dB	0.5 V

ADJUSTMENT

<Test Equipment>

1. Tester or DVM
   - Input: Sufficient
2. RF VTVM (RF V.M.)
   - Input impedance: 1 MΩ and less than 2 pF
   - Voltage range: F.S. = 10 mV to 300V
   - Frequency range: 150 MHz or greater
3. Frequency counter (f counter)
   - Minimum input voltage: 50 mV
   - Frequency range: 150 MHz or greater
4. DC power supply
   - Voltage 10V to 17V variable
   - Current: 8A min.
5. RF Power Meter
   - Dissipation: 50W
   - Impedance: 50Ω
   - Frequency range: 144 MHz
6. AF VTVM (AF V.M.)
   - Input impedance: 1 MΩ or greater
   - Voltage range: F.S = 1 mV to 30V
   - Frequency range: 50 Hz to 10 kHz
7. AF Generator (AG)
   - Frequency range: 100 Hz to 10 kHz
   - Output: 0.5 mV to 1V
8. Linear detector
   - Frequency range: 144 MHz
9. Directional coupler
10. Oscilloscope
    - With horizontal input and high sensitivity
11. Standard signal generator (SSG)
    - Frequency range: 144 ~ 149 MHz
    - Modulation: amplitude and frequency modulation
    - Output: −20 dB ~ 100 dB
12. AF Dummy load
    - 8Ω, 5W (approx.)
13. Sweep generator
    - Frequency range: 144 ~ 149 MHz

<Preparation>

Unless otherwise specified, set the controls as follows.

POWER / VOL SW	ON
SEND / REC	REC
SQUELCH VOL	MIN
M. CH SW	1
M. SW	OFF
M.R SW	OFF
SCAN SW	OFF
HOLD SW	OFF
M.S SW	OFF
TONE	OFF
HI /LOW SW	HI
25k / 5k (W) (T)	25k
10k / 5k (K) (M)	5k

Notes:

- When adjusting the trimmers or coils, use a non-induced adjusting rod of bakelite, etc.
- When adjusting the RX section never transmit to prevent SSG damage.
- Connect MIC connector as shown in Fig. 11.

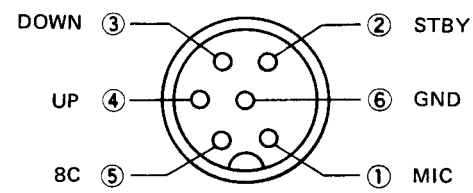


Fig. 11 MIC terminals (view from front panel side)

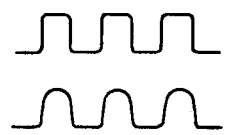
- The output level of SSG is indicated as SSG's open circut.

ADJUSTMENT

VOLTAGE CHECK

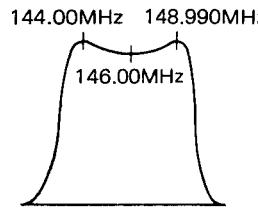
Item	Condition	Measuring point			Adjustment			Specifications	Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method		
1. Voltage check	1) Connect DC power (13.8V) to the radio.	DVM	RX.TX	8C				7.8~8.25V	Verify all voltage levels.
				8R				7.8~8.25V	
				8T				0V	
				ST				13~13.8V	
			Control	Pin 21 of IC1				5.0~5.4V	
				Pin 16 of IC2				5.0~5.4V	
	2) POWER SW : OFF		Control	Pin 21 of IC1	RX.TX	VR4	5.2V	±0.2V	
	3) POWER SW : ON Transmit.		RX.TX	8T				9.3~9.7V	Verify voltages.
				8R				0.5V or less	
	4) Return to receive.								

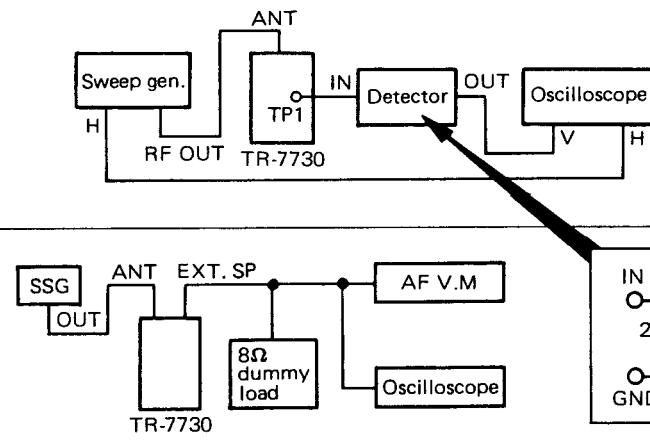
PLL ADJUSTMENT

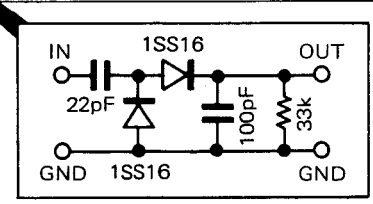
Item	Condition	Measuring point			Adjustment			Specifications	Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method		
1. PLL (1)	1) Remove the PLL shield. f : 147.000 MHz Disconnect the coax. connector J2 from the RX. TX unit.	Oscillo-scope	PLL	R51 (Emitter of Q9)	PLL	L7, 10	Adjust for square wave.	 OK NG	
	2)	RF V.M	PLL	TP4	PLL	L5	MAX	(0.4V)	( ) : reference value
2. PLL (2)	1) f : 144.000 MHz Receive.	f counter	PLL	TP4	PLL	L14	133.3000 MHz	±100 Hz	
	Transmit.					L13	144.0000 MHz		
	2) f : 144.005 MHz Receive.					TC4	133.3050 MHz	±100 Hz	
	Transmit.					TC3	134.0050 MHz		
	3) f : 144.000 MHz Receive.					L14	133.3000 MHz	±100 Hz	Check
	Transmit.					L13	144.0000 MHz		
3. Lock voltage	1) f : 144.000 MHz Receive.	DVM	PLL	TP1	PLL	TC1	1.9V	±0.01V	
	Transmit.					TC2	2.0V		
	2) f : 148.990 MHz Receive.							7V or less	Check
	Transmit.							6V or less	
4. Unlock voltage	1) Ground TP1 on the PLL unit. f : 145.000 MHz	DVM	PLL	ULB				Approx. 8V	Check 0.4V or less at locked state.
	2) Disconnect ground from TP1.								
5. Lock voltage check	1) Replace the PLL shield.	DVM	PLL	TP1	PLL	TC1	1.7V	±0.3V	
6. Frequency adjustment	1) f : 144.000 MHz Transmit.	f counter	PLL	TP4	PLL	L14	144.0000 MHz	±100 Hz	
	Receive.					L13	133.3000 MHz		

ADJUSTMENT

RECEIVER ADJUSTMENT

Item	Condition	Measuring point			Adjustment			Specifications	Remarks
		Test equipment	Unit	Terminal	Unit	Part	Method		
1. Helical resonator	1) Disconnect the LR coax. connector J4 from the RX. TX unit. Connect the sweep generator output to the ANT terminal.		RX.TX	TP1	RX.TX	L5, 6	Adjust L5 and 6 to obtain the waveform shown at right.		
	2) Reconnect the LR coax. connector on the RX.TX unit.								
2. Sensitivity	1) Connect a 100μA S meter to the M terminal on the RX.TX unit. Connect an AF V.M, oscilloscope and an 8Ω load to the EXT.SP terminal. Connect an SSG (MOD : 1 kHz, DEV : 5 kHz) to the ANT terminal.								
	2) f : 145.000 MHz	RF V.M	RX.TX	TP2	RX.TX PLL	L20 L5	} MAX	(0.7V)	
	3) SQ VOL : Min. Receive the SSG signal.	External S meter	RX.TX	M	RX.TX	L7, 8	MAX		
	4) SSG output level : 40 dBμ	AF V.M, Oscilloscope	Rear panel	EXT. SP	RX.TX	L11	MAX		
3. S meter	1) SSG output level : 15 dBμ Disconnect the external S meter from the M terminal.	S-indicator			RX.TX	VR1	Adjust VR1 so that the LED "8" indicator is lit.		
4. Squelch	1) SSG output level : −10 dBμ Fine tune the SSG frequency so that the SSG signal is received at maximum strength.								
	2) f : 145.020 MHz	BUSY-indicator						Must go off.	Check
	Turn the squelch control until noise is gated.	Squelch control setting						9 o'clock to 12 o'clock	
	3) f : 145.000 MHz	BUSY-indicator						Must be lit when the SSG signal is again received.	Check
	4) SQUELCH VR : Min.								
5. Sensitivity measurement	1) SSG output level : −6 dBμ f : 145.000 MHz AF gain control setting : 0.63 V/8Ω Fine tune the SSG frequency to obtain the maximum AF V.M reading.	AF V.M			< REFERENCE >			S/N 20 dB or more	Check





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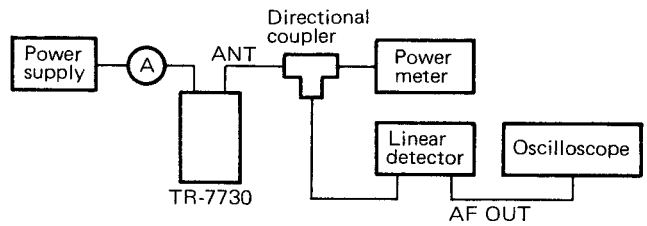
60 dB	500 μV
70 dB	1.58 mV
80 dB	5 mV
90 dB	15.8 mV
100 dB	50 mV
120 dB	0.5 V

ADJUSTMENT

TRANSMITTER ADJUSTMENT

Item	Condition	Measuring point			Adjustment			Specifications	Remarks
		Test equipment	Unit	Ter-minal	Unit	Part	Method		
1. Setting	Connect the power meter to the ANT terminal. f : 146.000 MHz RX.TX unit, TC1 : centered RX.TX unit, VR6 : fully clockwise								
2. Power and RF indicator adjustment	1) Transmit.	DC A.M, Power meter			RX.TX	L2 TC1	} MAX	30W or more	
					RX.TX	VR6	29W		
	2) HI/LOW : LOW				RX.TX	VR5	5W		
	3) HI/LOW : HI				RX.TX	VR6	20W		
	4) RF indicator at high power	RF indicator			Final	VR1	Set VR1 so that LED "10" is lit.		
	5) HI/LOW : HI	Power meter			RX.TX	VR6	29W		
	6) RF indicator at low power	RF indicator						At least one of the LEDs should light.	Check
3. Protection	1) HI/LOW SW : HI	DVM	RX.TX	PRO	Final	VR2	Min.	(0.4 V or less)	
	2) Disconnect the power meter from the ANT terminal.	DC A.M			RX.TX	VR7	1.5A	±0.1A	Adjust as quickly as possible.
4. Power check	1) Adjust the power supply voltage to 13.8V. Connect the power meter to the ANT terminal. f : 144.000MHz 146.000 148.990	Power meter, DC A.M						25W or more 5.5A or less	Check
	2) HI/LOW SW : LOW	Power meter, DC A.M						0.8~1.5W 1.2A or less	
5. Modulation	1) HI/LOW SW : HI Connect the AG (20mV, 1 kHz) to the MIC terminal.	Linear detector	minal.		RX.TX	VR3	5 kHz deviation	±0.3 kHz	
	2) AG output level : 2 mV, 1 kHz	Linear detector			RX.TX	VR2	3.5 kHz deviation	±0.3 kHz	
	3) Check for abnormal oscillation by varying the power supply voltage from 11.5 V to 16V at any frequency.							There ahould be no abnormal oscillation.	
	4) Return to receive.								

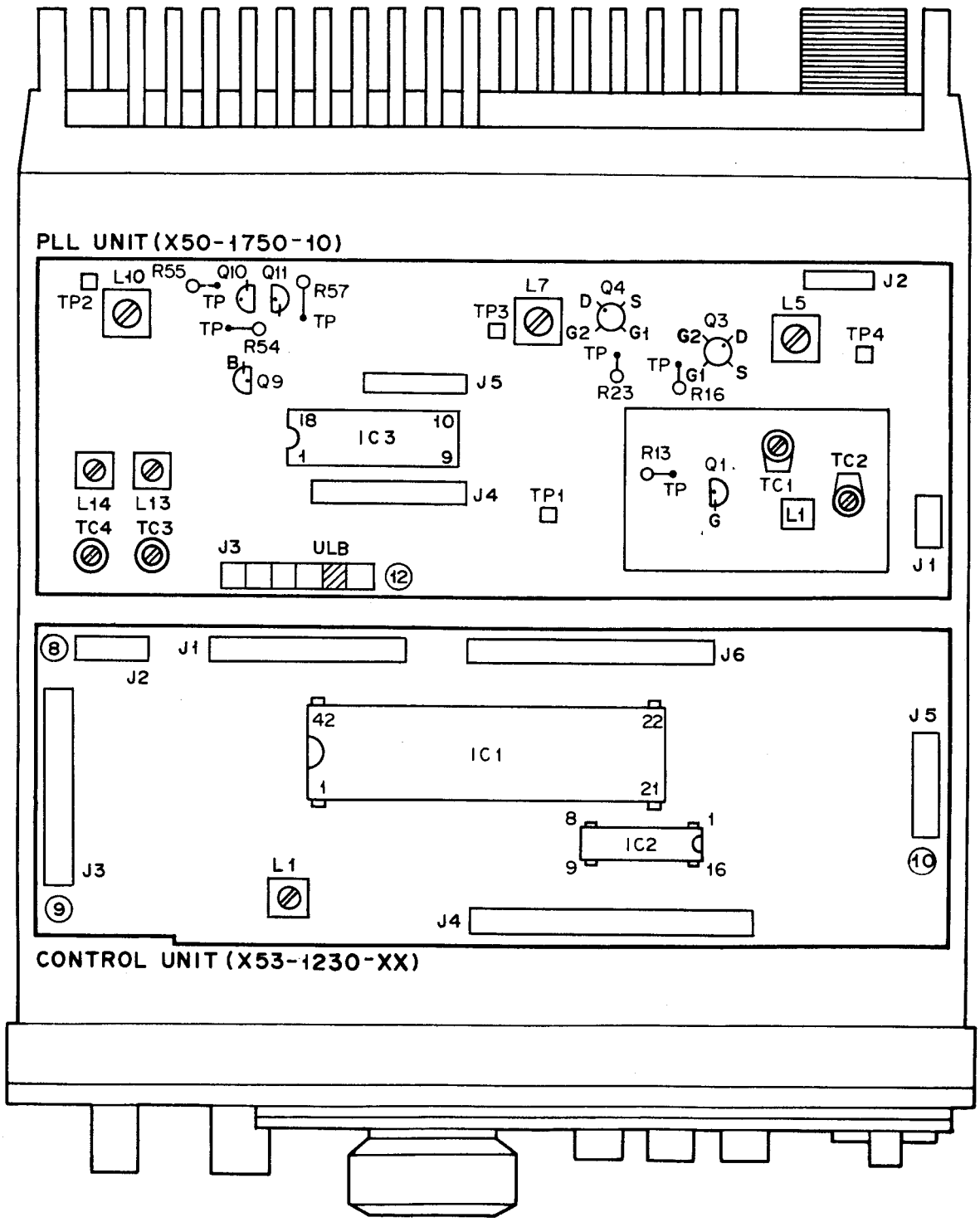
ADJUSTMENT

MICROPROCESSOR OPERATION CHECK

Item	Control functions	Microprocessor functions	Remarks
1.	1) Disconnect DC power. Reconnect after waiting 20 sec.	5.000 is displayed.	Reset operation check
2. Main dial	1) Turn the main dial.	Indication changes in 5 kHz increments.	
	2) 5K/10K SW : 10K,Turn the main dial.	Indication changes in 10 kHz increments.	
3. UP/DOWN	1) Press the UP or DOWN switch once. 2) 5K/10K SW : 5K	When pressed, the frequency indication increases or decreases in 5 kHz increments.	The frequency indication changes in 10 kHz steps with 5K/10 kHz SW at 10K.
	2)Press and hold the UP or DOWN switch.	The frequency indication increases or decreases continuously.	
	3) Press the UP and DOWN switch simultaneously.	The frequency does not change.	
4. Memory entry	1) M.CH switch : 1~5 M.R switch : ON	4.000 is displayed.	
	2) M.R switch : OFF M.S switch : ON	4.000 is displayed.	
	3) M.S switch : OFF M.CH switch : 1~5 M switch : ON	Pressing the M switch causes the displayed frequency to be stored in the selected memory corresponding to the M.CH switch setting.	
	4) M.CH switch : 5 Set the main dial in a position different from that set during step (3). Set in transmit mode and then press the M switch.	The displayed frequency is stored in the transmit frequency memory of memory 5.	In memory channel 5, the transmitting frequency is different from the receiving frequency.
	5) Return to receive.		
5. Memory recall	1) M.CH switch : 1~5 M.R switch : ON	Each frequency stored during step 4. (3) is displayed.	
	2) Turn the main dial.	The frequency displayed does not vary.	M.R operation has priority.
	3) UP/DOWN switch : ON		
	4) M.S switch : ON		
	5) SCAN switch : ON		
	6) M.S switch : OFF		
	7) M.CH switch : 5 Set in transmit.	The frequency stored during step 4. (4) is displayed.	
	8) Return to receive. M.R switch : OFF		
6. SCAN	1) Squelch control : Max SCAN switch : ON	The frequency increases in increments of 5 kHz.	
	2) Press and hold the SCAN switch.	Scan speed becomes faster.	
	3) Squelch control : Min.	BUSY indicator is lit and scan stops.	
	4) Squelch control : Max	Scan resumes.	
	5) Set in transmit.	Scan stops. .	
	6) Set in receive. SCAN switch : ON		
	7) HOLD switch : ON	Scan stops.	
	8) SCAN switch : ON		
7. Memory scan	1) M.S switch : ON	Frequencies stored in the memory during step 4. (3) are scanned.	Memory scan has priority.
	2) Squelch control : Min.	BUSY indicator is lit and scan stops.	Scanning order 1→2→3→5←4← 1~5 continuous.
	3) Squelch control : Max	Scan resumes.	
	4) Set in transmit.	Scan stops.	
	5) Return to receive. SCAN switch : ON	Scan resumes.	
8. Switch priority	1) M.R : ON	Memory reading	Priority 1st
	2) M.S : ON	Memory scan	2nd
	3) SCAN, HOLD : ON	Scanning operation	3rd
	4) UP DOWN : ON	UP/DOWN operation	4th
	5) Main dial		5th
	6) M : ON	Memory entry	6th

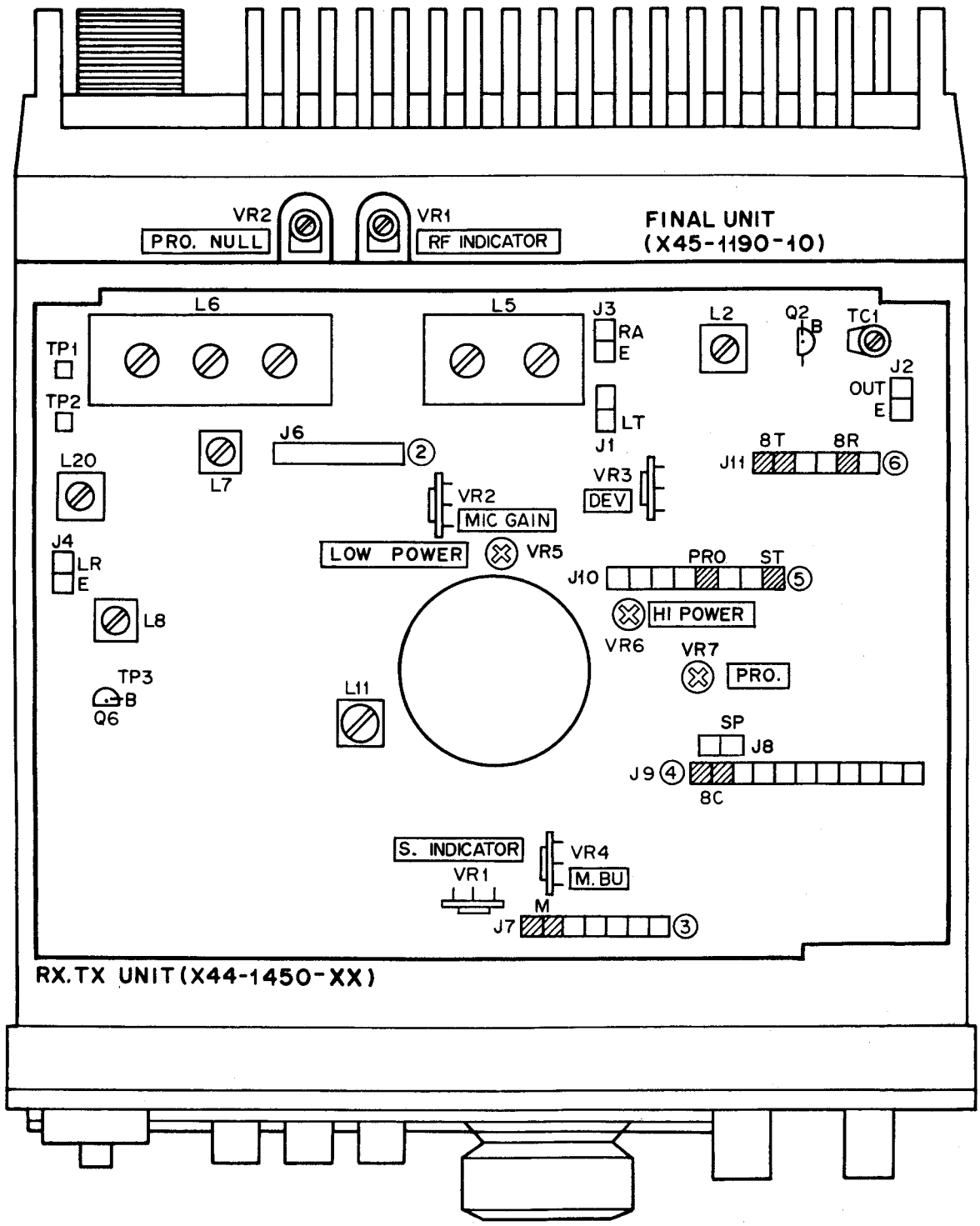
ADJUSTMENT

TOP VIEW

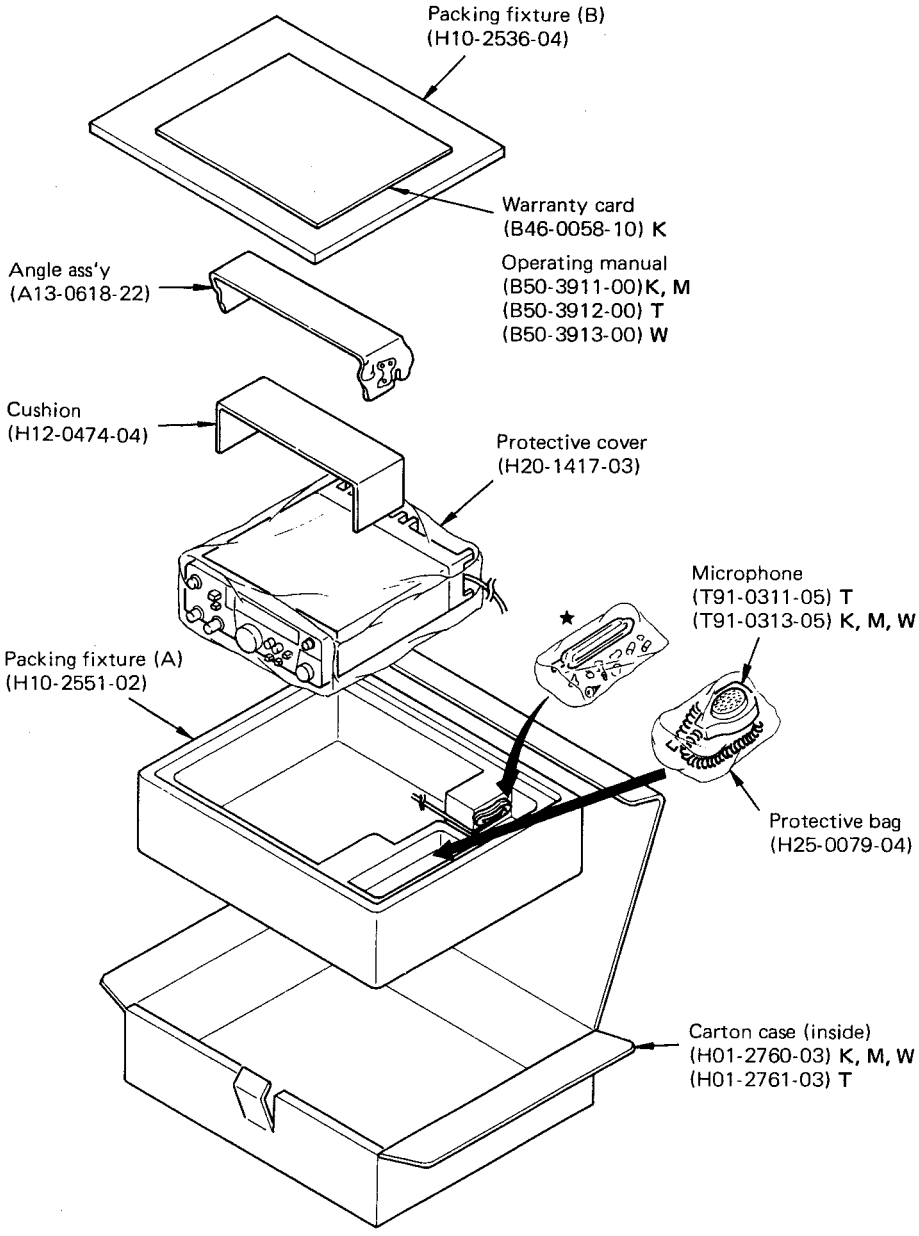


ADJUSTMENT

BOTTOM VIEW

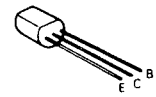


PACKING



★ Protective bag (H25-0103-04)
- Phone plug (E12-0001-05)
- DC cord (C) (E30-1689-05)
- Fuse 6A (F05-6021-05)
- Foot x 2 (J02-0022-05) (Rear)
- Foot (J02-0420-04) (Front)
- Foot mounting hardware x 2 (J21-2676-04)
- Protective bag (H25-0029-04)
  - Boss x 4 (J32-0748-04)
  - Bind screw x 4 (N35-3012-45)
- Accessary bag (H25-0049-03)
  - Round screw x 4 (N09-0008-04)
  - Flange nut x 4 (N14-0510-04)
  - Flat washer x 4 (N15-1060-46)
  - Spring washer x 4 (N16-0060-46)
  - Bind screw x 6 (N35-3006-45)

2SA1015
2SC1775
2SC1815
2SC1923
2SC1959
2SC2240



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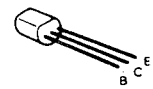

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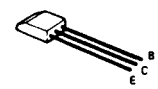
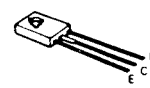
2SC460



2SC496



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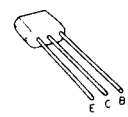
2SC2603



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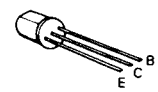
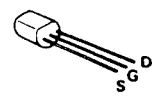
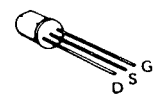


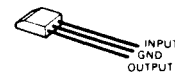
2SK30A



2SK19



μPC78L08A



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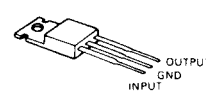
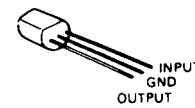
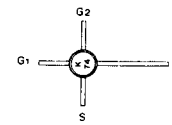


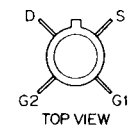
NJM78L06K



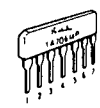
3SK74



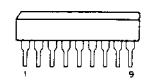
3SK76
3SK92



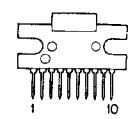
TC5081P
TC5082P-GL



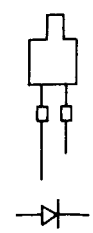
TA7061AP
TA7302P



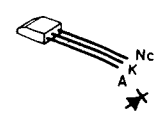
HA1366W



LN233RP
LN333GP
LN433YP

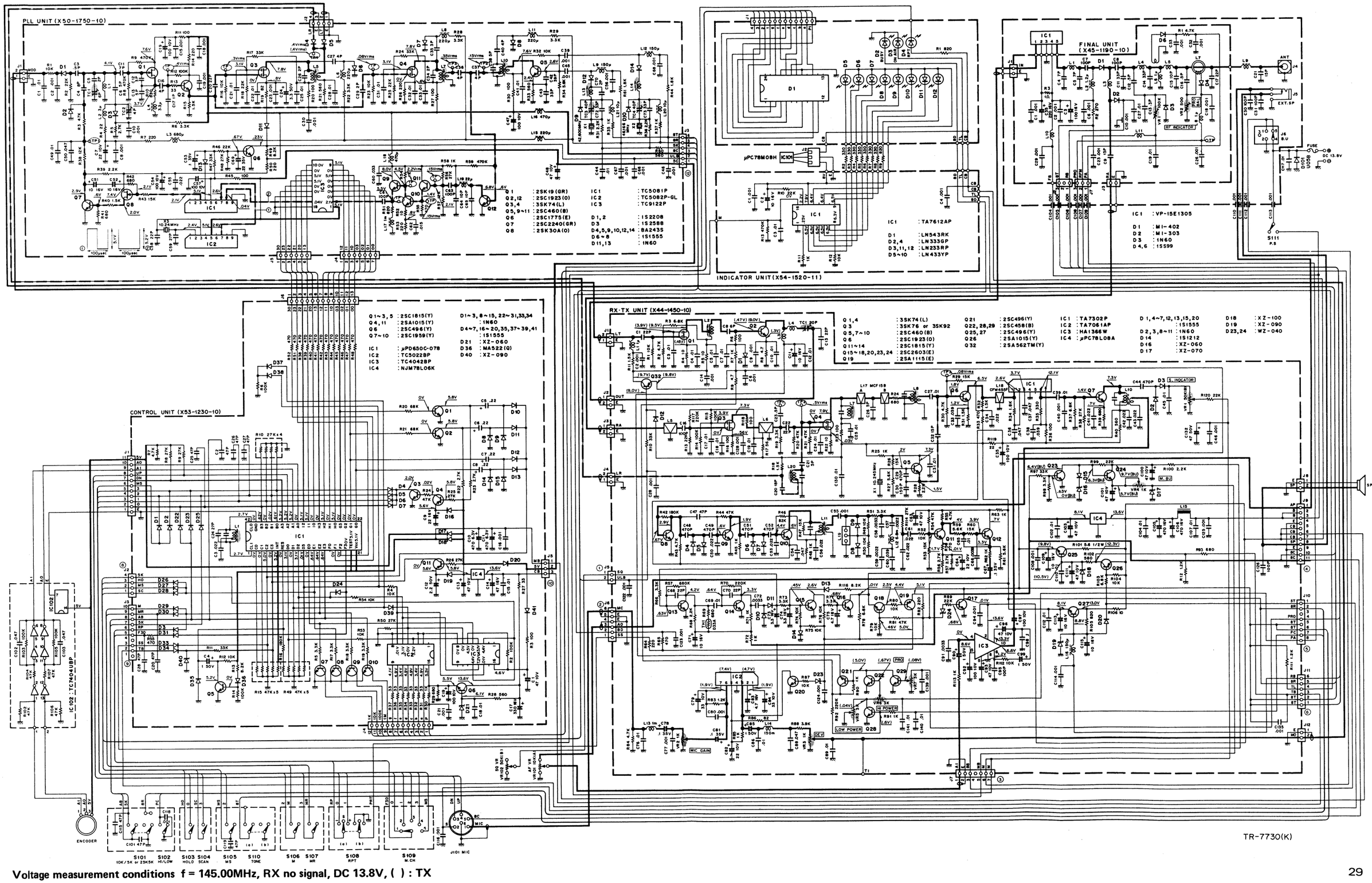


MA522



SCHEMATIC DIAGRAM (K, M TYPE)

Signal Line — — — Control Line ——— Common DC line



Q1 : 2SK19 (GR)
Q2,12 : 2SC1923 (O)
Q3,4 : 3SK74 (L)
Q5,9~11 : 2SC460 (B)
Q6 : 2SC1775 (E)
Q7 : 2SC2240 (GR)
Q8 : 2SK30A (O)

IC1 : TC5081P
IC2 : TC5082P-GL
IC3 : TC9122P

D1,2 : 1S2208
D3 : 1S2588
D4,5,9,10,12,14 : BA2435
D6~8 : 1S1555
D11,13 : 1N60

IC1 : TA7612AP

D1 : LN543RK
D2,4 : LN333GP
D3,11,12 : LN233RP
D5~10 : LN433YP

IC1 : VP-15E1305

D1 : MI-402
D2 : MI-303
D3 : 1N60
D4,6 : 1SS99

Q1~3,5 : 2SC1815 (Y)
Q4,11 : 2SA1015 (Y)
Q6 : 2SC496 (Y)
Q7~10 : 2SC1959 (Y)

IC1 : μPD650C-078
IC2 : TC5022BP
IC3 : TC4042BP
IC4 : NJM78L06K

D1~3, 8~15, 22~31, 33, 34 : 1N60
D4~7, 16~20, 35, 37~39, 41 : 1S1555
D21 : XZ-060
D36 : MA522 (Q)
D40 : XZ-090

Q1, 4 : 3SK74 (L)
Q3 : 3SK76 or 3SK92
Q5, 7~10 : 2SC460 (B)
Q6 : 2SC1923 (O)
Q11~14 : 2SC1815 (Y)
Q15~18, 20, 23, 24 : 2SC2603 (E)
Q19 : 2SA1115 (E)
Q21 : 2SC496 (Y)
Q22, 28, 29 : 2SC458 (B)
Q25, 27 : 2SC496 (Y)
Q26 : 2SA1015 (Y)
Q32 : 2SA562TM (Y)

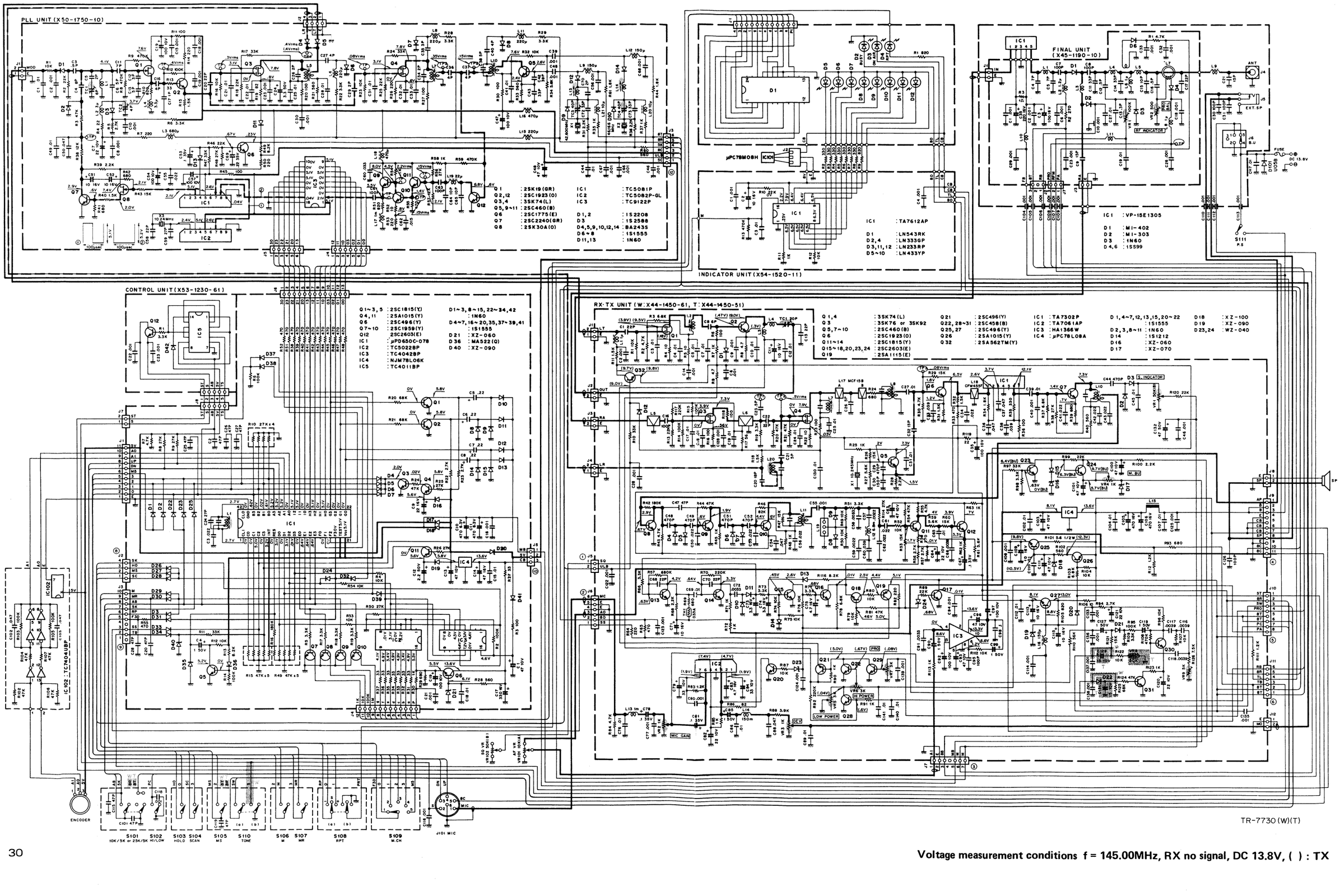
IC1 : TA7302P
IC2 : TA7061AP
IC3 : HA1366W
IC4 : μPC78L08A

D1, 4~7, 12, 13, 15, 20 : 1S1555
D2, 3, 8~11 : 1N60
D14 : 1S1212
D16 : XZ-060
D17 : XZ-070
D18 : XZ-100
D19 : XZ-090
D23, 24 : WZ-040

Voltage measurement conditions f = 145.00MHz, RX no signal, DC 13.8V, ( ) : TX

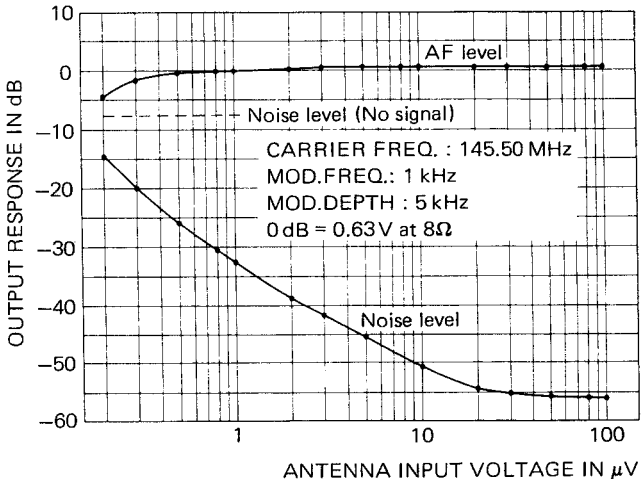
SCHEMATIC DIAGRAM (T, W TYPE)

Signal Line — Control Line — Common DC line

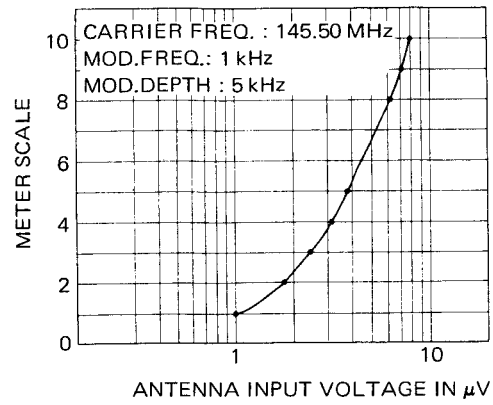


Voltage measurement conditions f = 145.00MHz, RX no signal, DC 13.8V, ( ) : TX

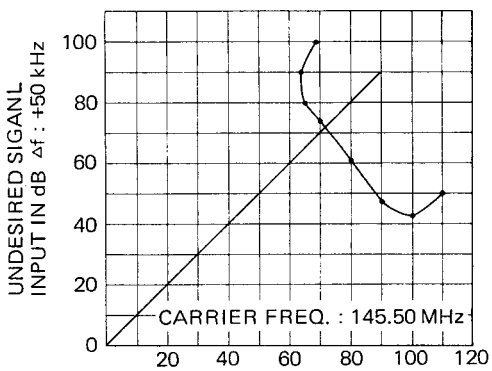
RX SENSITIVITY



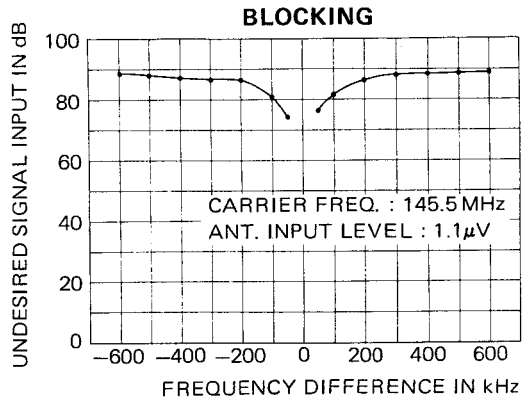
S LEVEL SENSITIVITY



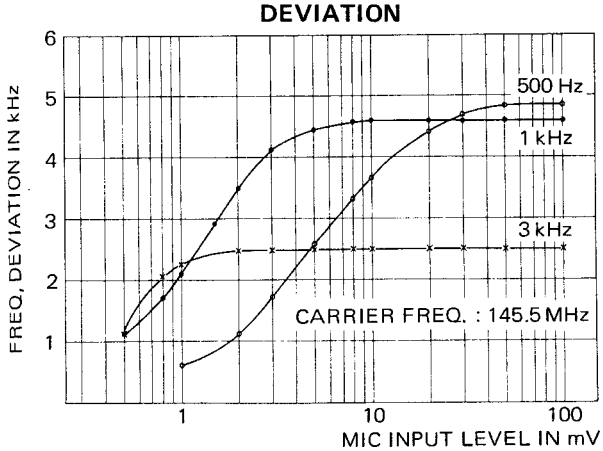
INTER MODULATION



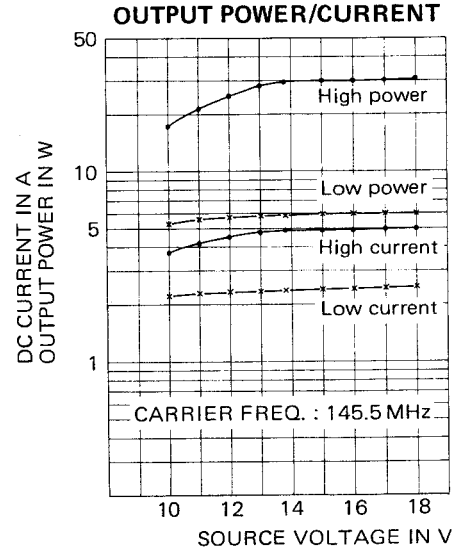
BLOCKING



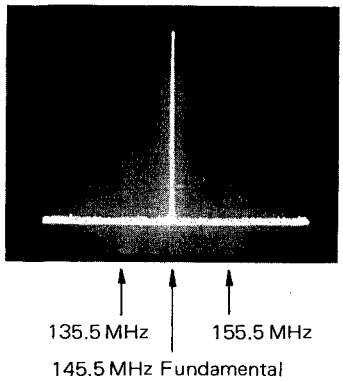
DEVIATION



OUTPUT POWER/CURRENT



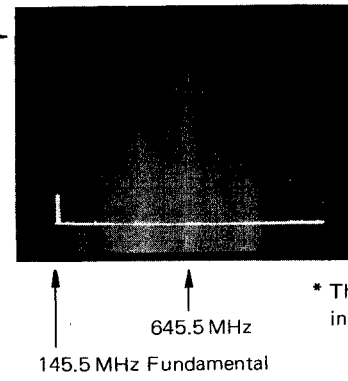
Near spurious response



CARRIER FREQ. : 145.50 MHz
RF POWER : 28W
SCAN WIDTH : 5 MHz/DIV
BAND WIDTH : 30 kHz
SCAN TIME : 0.1 sec
VIDEO FILTER : 10 kHz
INPUT ATT. : 20 dB
LOG REF LEVEL : −1 dBm
10 dB/DIV

Fundamental signal level*

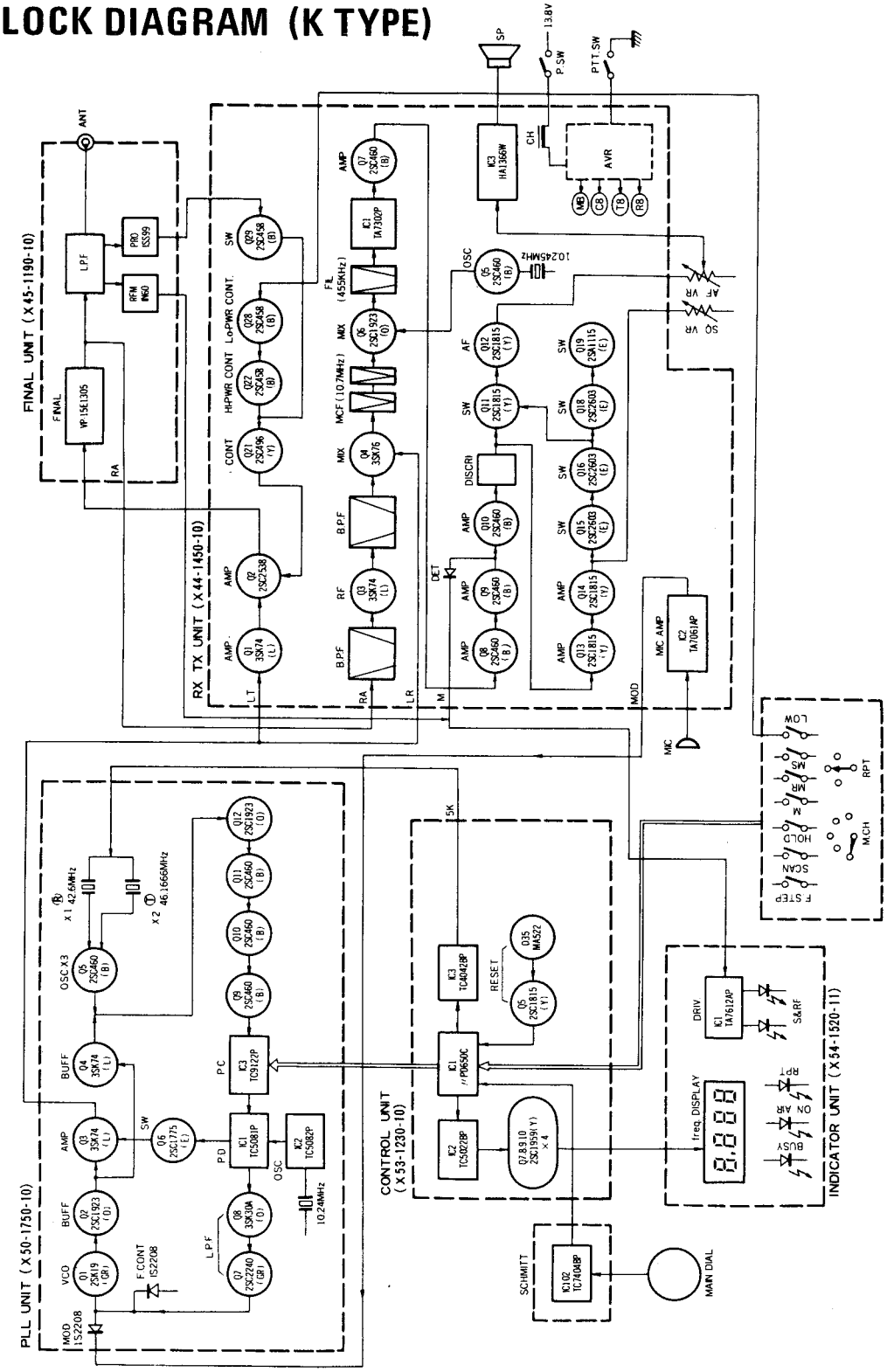
Harmonics spurious response



CARRIER FREQ. : 145.5 MHz
RF POWER : 28W
SCAN WIDTH : 100 MHz/DIV
BAND WIDTH : 300 kHz
SCAN TIME : 0.1 sec
VIDEO FILTER : 10 kHz
INPUT ATT. : 10 dB
LOG REF LEVEL : −1 dBm
10 dB/DIV

* The fundamental has been reduced in amplitude by the H.P.F.

TR-7730 BLOCK DIAGRAM (K TYPE)



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